FEB 4 1935

Vol. 6 JANUARY, 1935 No. 1

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THE JOURNAL OF PEDIATRICS

A MONTHLY JOURNAL DEVOTED TO THE PROBLEMS AND DISEASES OF INFANCY AND CHILDHOOD

Official Organ for
THE AMERICAN ACADEMY OF PEDIATRICS

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Published by THE C. V. MOSBY COMPANY, 3523-25 Pine Blvd., Saint Louis, U. S. A.

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Why Dextri-Maltose Merits Professional Favor

Continued down from 1911

1933

"Of the double sugars, lactose would seem the logical one to use since it is the natural carbohydrate of milk; as a matter of fact, however, there seems to be no advantage in giving lactose. Pure lactose is expensive; most commercial preparations contain impurities which have a slight laxative action. Pure maltose is not used for infant feeding. Cane sugar (sucrose, saccharose) is under almost all circumstances an entirely satisfactory product for use with infants; it is inexpensive and is always available in pure form.

"There are times, however, when it seems advantageous to give part of the carbohydrate in the form of polysaccharide; this is the case when diarrhea is present or when large amounts of sugar are to be fed. Since time is required for the hydrolysis of the higher carbohydrate, the absorption of sugar is more gradual, and an alimentary glycosuria is less likely to develop. The amount of fermentable sugar present in the intestine at one time is limited; hence fermentation is less likely to take place. Another advantage claimed for the use of polysaccharides is that the osmotic pressure of these substances is considerably less than that of the sugar resulting from their hydrolysis; there is therefore less tendency for water to be drawn into the intestine and perhaps lost in the stool when large amounts of carbohydrate are fed in this form. Mixtures of dextrin and maltose are usually employed when a polysaccharide is desired. A number of preparations are on the market which differ somewhat in their properties. The liquid malt extracts should not be used in diarrhea; they contain impurities which are somewhat laxative, and are therefore sometimes used in the treatment of constipation."—*L. E. Holt, Jr. and R. McIntosh: Holt's Diseases of Infancy and Childhood, D. Appleton & Co., New York, 1933, p. 151.*

1933

In congenital hypertrophic pyloric stenosis, "The diet should be breast-milk whenever possible; if this is not available buttermilk or partially skimmed lactic acid milk to which dextri-maltose is added is the best substitute."—*L. G. Parsons and S. Barling: Diseases of Infancy and Childhood, Oxford University Press, New York, 1933, vol. 1, pp. 743-749.*

1933

In the treatment of diarrhea, "Omit carbohydrate from the mixture until the stools assume a putty-like consistency, rather dry, without odor or mucus. This usually does not require more than one or two days. After this time it is very essential that Dextri-Maltose be gradually added to the twenty-four-hour high-protein mixture. Should constipation follow, Dextri-Maltose No. 3 should be used instead of Dextri-Maltose No. 1. The addition of carbohydrate is usually accomplished by beginning with 1 level tablespoonful of Dextri-Maltose No. 1, and increasing gradually 1 tablespoonful every other day, until the baby is taking 5 or 6 tablespoonfuls of Dextri-Maltose in the twenty-four-hour feedings."—*M. A. Bridges: Dietetics for the Clinician, Lea & Febiger, Phila., 1933, p. 536.*

1933

In the treatment of diarrhea, "Carbohydrate must be added in a day or two, starting with two level tablespoonfuls of Dextri-Maltose to the day's formula and increasing to six or eight level tablespoonfuls as rapidly as the infant's clinical course permits."—*H. D. Lynch: The diarrhoeas of early life, J. Indiana M. A. 26:155-159, April 1933.*

1933

In the treatment of diarrhea, "Dextri-Maltose grs. 10, may be added to each feed for the first 48 hours, and this amount may be gradually increased. By the beginning of the fourth day the interval between feeds can be increased to three hours. The amount of the feed is then about 2 oz. with added dextri-maltose grs. 30, eight feeds being given in 24 hours."—*J. B. Young: Diarrhoea and vomiting in infants, Lancet, 1:677-680, April 1, 1933.*

1933

In the treatment of celiac disease, "A second point which is also of very great importance is that starch should, as far as possible, be given in the partially-digested form of dextrimaltose. In this form there is much less tendency to fermentative changes, the abdomen tends to be less distended and the stools less frothy."—*R. E. Steen: Coeliac disease, Brit. J. Child. Dis. 30:163-180, July-Sept. 1933.*

1934

In the postoperative care of pyloric stenosis, "If unable to obtain breast milk, a high protein diet is used; a formula of albumin milk and dextri-maltose is arranged to fill the caloric needs."—*E. G. Hummel: Congenital hypertrophic pyloric stenosis in infancy, J. Med. Soc. N. J. 31:152-156, March 1934.*

1934

"Boiled human milk was the food of choice, but if it was not available a cow's milk formula was substituted. For the past year only one formula has been used. It consists of equal parts of unsweetened evaporated milk and water with the addition of three per cent dextrimaltose No. 1. This formula gave excellent results and was used interchangeably with the boiled human milk with no unsatisfactory outcome."—*A. V. Stoesser and E. C. Perlman: The care of the premature infant, Minnesota Med. 17:70-76, Feb. 1934.*

1934

"The type formula used consists of simple dilutions of milk, water and some carbohydrate, usually dextri-maltose, although granulated sugar and lactose have also been prescribed."—*A. Tow: Simplified infant feeding, a four feeding schedule, Arch. Pediat. 51:49-54, Jan. 1934.*

1934

"Lactose has no special value when added to the feed, and many consider it to be less digestible than some of the cheaper sugars. When, however, we consider the case of the child who is prone to get indigestion, there is no doubt that in these conditions a mixture of dextrin and maltose is the most easily tolerated of all carbohydrates. . . . 'Dextri-maltose,' however, is tolerated when other carbohydrates produce fermented stools."—*D. Paterson and J. F. Smith: Modern Methods of Feeding in Infancy and Childhood. Constable & Co., Ltd., London, 4th ed. 1934, pp. 62-63.*

1934

For marasmus with intestinal intoxication, "Even in these small infants it is a very wise move to give nothing by mouth, but a 15% sugar solution consisting of 6 tablespoonfuls of Dextri Maltose No. 1 and 3 tablespoonfuls of cane sugar added to 1 pint of water. This should be offered to the infant every hour and it should be allowed to take as much as it will."

In marasmus without gastrointestinal symptoms, "The carbohydrates of choice are Dextri Maltose No. 1 or one of the starches."—*W. A. Hawk: A few of the commoner feeding problems of infancy, Univ. Toronto M. J. 11:218-229, May 1934.*

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The Journal of Pediatrics

VOL. 6 JANUARY, 1935 NO. 1

Original Communications

CELIAC DISEASE (CHRONIC INTESTINAL INDIGESTION)

A REPORT OF THREE CASES WITH AUTOPSY FINDINGS

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CHICAGO, ILL.

CELIAC disease, as we know it clinically, is a manifestation of a chronic disturbance of digestion. The typical findings of the later stages are stunted growth, abnormal abdominal distention, and intermittent attacks of diarrhea, characterized by large, pale, mushlike, foul-smelling stools. When recognized in the earlier stages, the symptoms are far more difficult of interpretation.

The anatomical findings are still the subject of much controversy. Changes in the liver, pancreas, gastrointestinal tract, and glands of internal secretion all have been held responsible for the clinical symptoms. The failure to find in all cases similar pathologic lesions in the same organ or organs at autopsy has led many investigators to regard celiac disease not as a morphologic entity, but as a functional disorder with, in fatal cases, secondary pathologic lesions.

We wish to emphasize the fact that studies based on autopsy findings are rare (Parsons[1]) as compared with the numerous clinical reports of celiac disease in the literature.

A short review of postmortem findings reported by various authors and of their expressed views as to the origin of this disease is recorded in this paper. We are reporting short clinical histories and detailed autopsy findings of three children, aged nine months, one and a half years, and three years, respectively. Comprehensive clinical studies of this disease may be found in the articles by Parsons,[2] and by Lehndorff and Mautner.[3]

From the Sarah Morris Hospital for Children and the Departments of Pathology of the Nelson Morris Institute of the Michael Reese Hospital and of the University of Illinois Medical School, Chicago.

Aided by a Grant from the Otto Baer Fund.

LITERATURE

Gee[4] in 1888 stated that "naked eye examination of dead bodies throws no light upon the nature of celiac infection. Nothing unnatural can be seen in the stomach, intestines, or other digestive organs. Whether atrophy of the glandular crypts of the intestines be ever or always present, I cannot tell."

Gibbons[5] in 1889 stated his conclusions in regard to the celiac affection: "That as pathologic anatomy teaches us nothing regarding it, this disease, for the reasons already adduced, depends upon a functional disturbance of the nervous supply of the liver, pancreas, glands of Brunner, and follicles of Lieberkühn, possibly also on those of the stomach and salivary glands. That as this causes a serious alteration of the digestive process, the food is too readily decomposed, and that the absorption into the blood of deleterious elements produces the profound ill health from which patients attacked by this disease suffer."

Herter[6] in 1908 concluded that "the impaired absorption of foodstuffs is probably to be ascribed to a chronic inflammation located in the ileum and colon and associated with the presence of abnormal forms of bacteria."

Poynton, Armstrong, and Nabarro[7] in 1914 described a histologically recognizable increase of the interlobar fibers in the pancreas. This was brought out by the use of the van Gieson stain. Inflammatory changes were found in the intestinal tract, and fatty changes, in the liver.

Bramwell[8] in 1915 stated that the defective or arrested pancreatic secretion is probably due to chronic pancreatitis. But, on the other hand, he remarked that "cases of arrested development associated with and apparently due to chronic diarrhea are not very uncommon, but in most of these cases there is, so far as our present information enables us to judge, no defective pancreatic secretion."

Still[9] in 1918 found changes in the intestines and pancreas. He believed that it is conceivable that these inflammatory changes are secondary to some functional failure of the digestive secretion.

Passini[10] in 1919 found cystic degeneration of the pancreas, with atrophy of the gland in two instances, and dilated ducts with retention of the secreted material and foci of necrosis in the pancreas in a third child.

Moorhead[11] in 1920 noted a marked catarrhal inflammation of the intestines. Miller, Webster, and Perkins[12] also in 1920 stated that pancreatic tests in celiac disease invariably gave negative results.

Wallis[13] in 1920 stated as follows: "In the remarkable collection of cases of celiac disease, it will be found that the diastase is always on the high side of normality, and there is frequently an associated steatorrhea. Complete and definite evidence of any pancreatic deficiency is, however, wanting, and with the present state of our knowledge of this disease such a conclusion is unjustifiable."

Miller[14, 15] in 1921 and 1923 reported the absence of chronic changes in the liver, pancreas, and intestines. He concluded that "persistence of the excessive fat wastage is independent of morbid changes in these organs."

Schick and Wagner[16] in 1923 found marked atrophy of the thymus, thyroid, suprarenals, pancreas, and the mucosa of the duodenum. Taylor[17] in the same year stated that fifteen necropsies are described in the literature but at least ten must be thrown out of consideration as there was no evidence that they were cases of celiac disease. Three of the remaining five showed small infiltrations and fibrosis of the pancreas, particularly about the ducts, and one showed, in addition to the changes in the pancreas, fatty degeneration in the liver. No anatomic changes were found in the other two cases. He concluded that it is probable that the anatomic lesions were the result of long-standing indigestion with irritative bowel contents and an abnormal bacterial flora of the intestinal tract. He also

reported seven new observations. The liver was smaller in every case. In one instance leucine and tyrosine were found in the urine; a pathologic pigment, in the duodenal juice in another instance; and a third case was complicated with Banti's disease. There were, however, no autopsy examinations.

Pipping[18] in 1924 reported fatty changes in the liver and generalized anemia. The pancreas was not mentioned.

Clarke and Hadfield[19] in 1924 found the pancreas shrunken and partly replaced by connective tissue. More islet tissue per unit was seen in the sections of the pancreas than encountered normally. Chronic ulcerative colitis and fatty metamorphosis of the liver were also found.

Ryle[20] in 1924 thought that "the inability to absorb fats in celiac disease and the attendant complications, such as infantilism and tetany, can best be accounted for by an obstructive lesion (probably infective in origin, as the disease is acquired and not congenital) of some parts of the lacteal tree." Persons and Neale[21] in 1928, however, could not substantiate this supposition.

Mautner[22] in 1925 observed a marked fat infiltration of the liver. The pancreas revealed degeneration of the parenchyma; there was a reduction of the cytoplasm of the cells lining the ducts and a moderate lymphocytic infiltration. The islet cells contained fat droplets.

Potter[23] in 1926 stated that postmortem examinations have shown very little evidence of value. In some instances a slight thickening of the mucous membranes of the intestines and in others a small cellular infiltration and fibrosis around the pancreatic ducts were encountered.

Göttche[24] in 1926 believed that dysentery was the "primum movens" in celiac disease. Gross[25] in the same year found an almost complete atrophy of the parenchyma of the pancreas, combined with fat infiltration. The islets were increased in number.

Payne[26] in 1927 stated that there seemed no definite pathologic lesions in celiac disease. Levinsohn[27] in 1927 remarked that in proportion to the severity of the disease no characteristic anatomic findings were demonstrable in instances of celiac disease. Atrophy and fatty degeneration of the various endocrine and digestive glands were occasionally reported, but the changes were no different from those seen in starvation, avitaminosis, and ascites and may be regarded as secondary. The pancreas, as might have been expected, seemed to be most affected, but not the island apparatus.

Fanconi[28] in 1928 reported a normal length of the mesentery and intestines in his six cases. No abnormalities were noted in the glands of internal secretion. The intestines appeared atrophic and fat droplets were found in the intestinal epithelium. The pancreatic parenchyma revealed fat while the islets were free from fat. He concluded that these changes were the result of inanition.

Bloch[29] in 1928 found a chronic insufficiency of the digestive glands together with a superficial subchronic inflammation of the mucous linings of the intestines. In order to rule out postmortem changes as being the cause of the intestinal changes he had injected a solution of 10 per cent formalin into the peritoneal cavity and stomach shortly after death. He also stated that anatomic changes in the organs of internal secretion were not the cause of celiac disease.

Bauer[30] in 1928 concluded that the etiology of celiac disease must be sought in some agent or influence that disturbs that site of the metabolic balance which is concerned with the transfer of used fats and carbohydrates back again in the intestinal tract.

Harper[31] in 1930 stated that evidence of pancreatic disease has not been found at postmortem examinations with sufficient frequency to assume a primary disease of the pancreas as the cause of celiac disease.

Freise and Walenta[32] in 1931 reported that the severing of the celiac plexus in young pigs produced a complex of symptoms which was characteristic of celiac disease.

Parsons[2] in 1932 made the following statement: "Symptoms that are so severe and protracted as those occurring in well-marked celiac disease should, if the disease be due to anatomic change, show very definite lesions."

A summary of the short abstract of the more important literature reveals that changes in almost every organ of the digestive tract and in the glands of internal secretion have been held responsible for celiac disease from time to time. If such changes were not found, primarily functional disorders were thought to be the causative factors.

CASE REPORTS

Three patients of whom a clinical diagnosis of celiac disease was made came under our observation. It does not fall within the scope of this communication to relate in detail the clinical findings and the differential diagnosis; therefore, these findings are abstracted only briefly.

A postmortem examination was performed in each instance. Blocks were cut from the various organs, fixed in 10 per cent formalin, and stained routinely with hematoxylin-eosin. Particular attention was paid to the thyroids, suprarenals, thymus, liver, pancreas, and gastrointestinal tract. In addition to the hematoxylin-eosin preparations, blocks of these organs were stained according to the van Gieson method for the presence of connective tissue. Silver stains were used (Foote's reticulum stain) to demonstrate reticulum fibers. Other sections were stained according to the Warthin-Starry method and examined for the presence of *Spirocheta pallida*. Frozen sections were cut and stained for fat with sudan III and sudan IV.

CASE 1.—*Onset and Course.*—The patient, a white female infant, aged nine months, weighed 7½ pounds at birth. There was a history of frequent bowel movements, dating from shortly after birth. She was partially breast fed, with complemental feedings of pasteurized milk until she was four and one-half months old. At the time of weaning she was kept on cow's milk plus carbohydrates. She was first admitted to the hospital at five months of age, with a diagnosis of celiac disease. Up to this time there had been no serious illnesses other than intestinal disturbance as evidenced by frequent stools of large size, numbering from four to six daily. At five months she weighed 9 pounds 14 ounces. She was kept on a high protein diet and discharged after thirteen days in the hospital. She remained under observation for the following four months, when, although on a high protein diet, she had several exacerbations of her intestinal trouble, at which times she passed large, foul-smelling stools, averaging from four to six daily. She was again admitted to the hospital at nine months with a diagnosis of bronchopneumonia; at this time she weighed 12 pounds 4 ounces. The outstanding findings, other than the pneumonia, were emaciation and a markedly distended abdomen. She died twelve days after admission.

Autopsy Findings

Gross Changes.—(Only the more important lesions will be described.) The body was that of a well-developed but markedly undernourished white female infant about

ten months old. There was a bilateral bronchopneumonia with abscess formation. The liver was softer in consistency than normal and of about normal size. On section, the architecture was slightly obscured, and the surface, grayish brown. Throughout the cut surface, many minute, yellow, irregularly outlined dots were

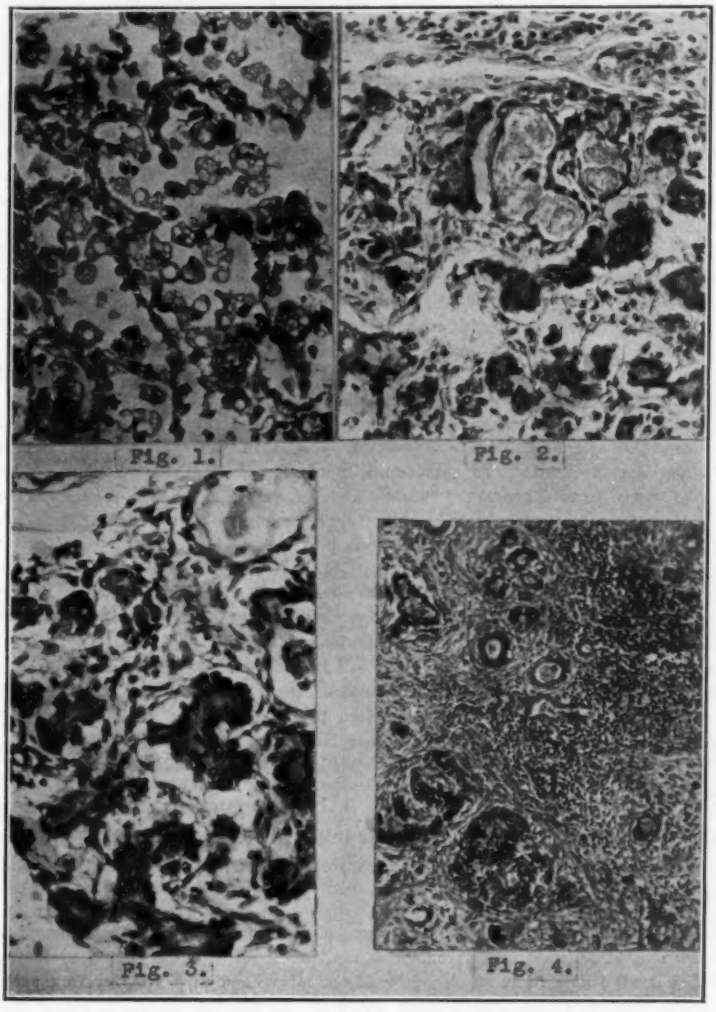

Fig. 1.—Case 1. Lung. Note the large fat-containing phagocytic cells within the alveoli. (Hematoxylin-eosin preparation, ×350.)

Fig. 2.—Case 1. Pancreas. Fibrosis of the pancreas. Note the dilatation of the ducts, and the concrements. (Hematoxylin-eosin preparation, ×300.)

Fig. 3.—Case 1. Pancreas. Note the apparently regenerated parenchymal cells. (Hematoxylin-eosin preparation, ×350.)

Fig. 4.—Case 1. Pancreas. Lymphocytic infiltration and large islands of Langerhans. Note the early fibrosis of the islands. (Iron-hematoxylin-eosin preparation, ×120.)

seen, apparently situated in the central zones. The periportal spaces revealed no changes. The pancreas was hyperemic and slightly thicker than normal but otherwise presented no gross changes. The entire gastrointestinal tract was distended; the mucosa, thickened and finely granular in appearance. There was an excessive amount of a greenish mucus, which in some regions was firmly attached to the mucosa. There were no ulcers. The Peyer's patches and solitary follicles were swollen. The suprarenals were thin but otherwise appeared normal. Neither the thymus nor the thyroid revealed any gross changes.

Histologic Findings.—Lungs: The alveoli contained a large number of polymorphonuclear leucocytes and also large monocytic cells revealing a clear or foamy cytoplasm and an eccentrically situated vesicular nucleus. The cytoplasm of these cells contained fat globules. Other alveoli contained red blood cells, a serum precipitate, and large clear cells similar to those just mentioned. A few fields revealed areas of necrosis with many clumps of bacteria. The bronchi were filled with polymorphonuclear leucocytes and desquamated lining cells.

Liver: Surrounding the central zones the liver cells contained many minute fat globules. These changes extended to about the midportion of the liver lobule. The periportal spaces were conspicuously free from fat.

Pancreas: The normal architecture of the pancreas was completely obscured. There was a marked new formation of connective tissue traversing the sections. The acini appeared very small, and in many instances groups of parenchymal cells were entirely separated from one another by newly formed connective tissue. The cytoplasm of the lining cells was often granular, and the outlines of the nuclei indistinct. Occasionally, mitotic figures were seen in these cells. The islands of Langerhans could easily be made out; many seemed enlarged. Very occasionally, the newly formed connective tissue extended into the islands. The ducts in the sections were markedly dilated, and many were filled with a granular material. In addition, many ducts contained concentric pink-stained bodies which could easily be interpreted as concrements. Warthin-Starry stains failed to reveal spirochetes. Fat stains revealed a very small number of minute fat globules within the cells of the islands of Langerhans. The stroma revealed a slight infiltration of lymphocytes and a few polymorphonuclear leucocytes.

Small Intestines: Sections from the small intestines revealed the mucosa richly infiltrated with lymphocytes and a few polymorphonuclear leucocytes. A moderate new formation of connective tissue was seen in the submucosa, with a few endothelial cells, eosinophilic cells, and polymorphonuclear leucocytes.

The suprarenals, thymus, and thyroid revealed no histopathologic changes.

The main pathologic diagnosis was: bronchopneumonia with abscess formation, chronic pancreatitis with much fibrosis, pancreatic lithiasis with dilatation of the ducts, chronic enteritis, and fat infiltration of the liver (centrally located).

CASE 2.—*Onset and Course.*—The infant, a white male, aged eighteen months, had frequent bowel movements from birth until six months of age, often averaging twelve or more per day, and composed largely of mucus and curds. After six months the stools were more normal in color but large in amount, at times fairly well formed, and always with a bad odor. Vomiting was also frequent up to the third month.

Feeding History.—Until two months of age the infant was on breast milk, complemented by cow's milk and dextrimaltose. During the third month he had supplementary feedings of protein milk, and from the third to the sixth month, protein milk alone. At this time he was placed on goat's milk for one month; then on

Carnation milk until he was nine months old when he weighed 16 pounds 10 ounces. At nine months he developed tonsillitis and lost 1 pound 7 ounces in weight.

He was first admitted to the hospital at ten and one-half months. He was a small but fairly well-nourished infant. Further positive physical findings were flaring of the lower ribs with moderate beading. The abdomen was large and tense. There was moderate epiphyseal enlargement.

Clinical diagnosis was rickets and chronic intestinal indigestion. The possibility of a food allergy was given serious consideration.

The child was discharged after ten days in the hospital and was readmitted at eighteen months. During the interval the child had been on a high protein diet consisting of protein milk, eggs, cottage cheese, orange juice, bananas, and, more recently, small amounts of vegetables, together with cod liver oil and viosterol. He was readmitted with a diagnosis of influenzal pneumonia and died on the third day after admission.

Autopsy Findings

Gross Changes.—The patient was a well-developed, markedly undernourished white male infant about eighteen months old. There was a bilateral bronchopneumonia.

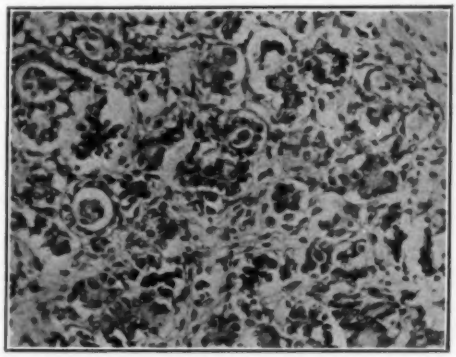

Fig. 5.—Case 2. Pancreas, marked fibrosis. (Hematoxylin-eosin preparation, ×200.)

The liver was slightly enlarged. On section the surfaces were brownish gray. Throughout the surfaces were seen minute yellow dots, which were confined to the central zones. The periportal spaces showed no gross changes. The pancreas presented no gross abnormalities. The mucosa of the stomach was pale and the rugae flattened. The mucosa of the duodenum and upper jejunum was hyperemic; the Peyer's patches and solitary follicles were swollen and slightly granular. The mucosa of the distal ileum was thrown into folds and covered with an excessive amount of mucus. The jejunum measured 300 cm. in length; the ileum, 50 cm., while the entire intestinal tract measured 457 cm. The mesenteric nodes were enlarged and soft, presenting pink surfaces. The suprarenals, thymus, and thyroid showed no gross changes.

Histologic Findings.—Lungs: Sections revealed many of the alveoli containing polymorphonuclear leucocytes in addition to large monocytic cells showing a foamy cytoplasm and a slightly eccentrically situated nucleus. These cells were filled with fat, as could be demonstrated by special stains.

Liver: Surrounding the central veins the liver cells appeared foamy and many of them contained minute fat globules.

Pancreas: The normal architecture of the pancreas was completely destroyed. Pancreatic parenchyma could be recognized in only a few fields in each section. There was a marked new formation of connective tissue separating small tubuli from one another. Many of the cells lining the acini showed indistinctly stained nuclei and a granular cytoplasm. There were, however, cells present which showed hyperchromatic nuclei, and occasionally mitotic figures were recognized in these cells. The islands of Langerhans seemed larger than normal and showed many hyperchromatic nuclei. Occasionally, a moderate amount of connective tissue was also seen within the islets. Small fat granules could be seen in some of the islet cells. The ducts in the sections were markedly distended and many contained a reddish granular débris. Here and there were seen a varying number of pink-stained concentric bodies, which gave the impression of concrements. Other ducts contained desquamated lining cells. The stroma consisted of connective tissue fibers, some of which seemed hyalinized. Only a few fibroblasts were seen. Here and there, a slight infiltration of lymphocytes and very few polymorphonuclear leucocytes could be made out. Spirochetes could not be demonstrated.

Small Intestines: Sections of the small intestines revealed a moderate infiltration of lymphocytes, endothelial cells, and a few polymorphonuclear leucocytes. There was a marked new formation of connective tissue in the submucosa. The lymph follicles, particularly in the region of the jejunum, were hyperplastic, their centers revealing much karyorrhexis and karyolysis.

Suprarenals, Thyroid and Thymus: No histopathologic changes were noted.

The main pathologic diagnosis was: bronchopneumonia, recent, chronic pancreatitis with much fibrosis, pancreatic lithiasis, dilatation of the pancreatic ducts, chronic enteritis, abnormal length of the jejunum, and fat infiltration of the liver (centrally located).

CASE 3.—The patient, a white female child, aged three years, was admitted to the hospital for the first time at seven months.*

Onset and Course.—She was breast fed for two weeks, following which she was given a cow's milk formula for two months, and during the following six weeks was placed on various other formulas, because of unsatisfactory gain in weight. At four months she developed her first attack of diarrhea, which continued for one month. Following this, her progress was fair for three weeks, when she again developed diarrhea.

She was admitted to the hospital for the second time when she was three years old. Between her fifth month and third year her progress had been slow, and she had recurrent attacks of intestinal indigestion and diarrhea. She had pneumonia at one and one-half years and measles at two and one-half years. Her history was otherwise negative except for the gastrointestinal disturbances.

The admission diagnosis on the day before her death was anhydremic intoxication, celiac disease, and athrepsia.

Autopsy Findings

Gross Changes.—The body was that of a well-developed but markedly undernourished white female appearing to be two years old. The lungs revealed bilateral bronchopneumonia. The architecture of the liver was indistinct, and no details as to central zones or periportal spaces could be made out. The surfaces were yellowish. The pancreas showed no gross changes. A few diverticula were present in the stomach. The ileum showed enlarged follicles and Peyer's patches, which were granular and distinctly raised. The mucosa was slightly thicker than normal

*We are indebted to Dr. I. A. Abt for the use of the clinical record.

and was covered with an excessive amount of mucus. The mesenteric nodes were enlarged, soft, revealing pink surfaces. The left kidney showed an irregular golden brown, rather soft stone measuring 5 mm. in diameter. No gross changes were found in the suprarenals, thyroid, and thymus.

Histologic Findings.—Lungs: Sections revealed many of the alveoli filled with large mononuclear cells showing a clear cytoplasm which contained large fat globules. Many of the alveoli were completely filled with these phagocytic cells. Other alveoli contained polymorphonuclear leucocytes.

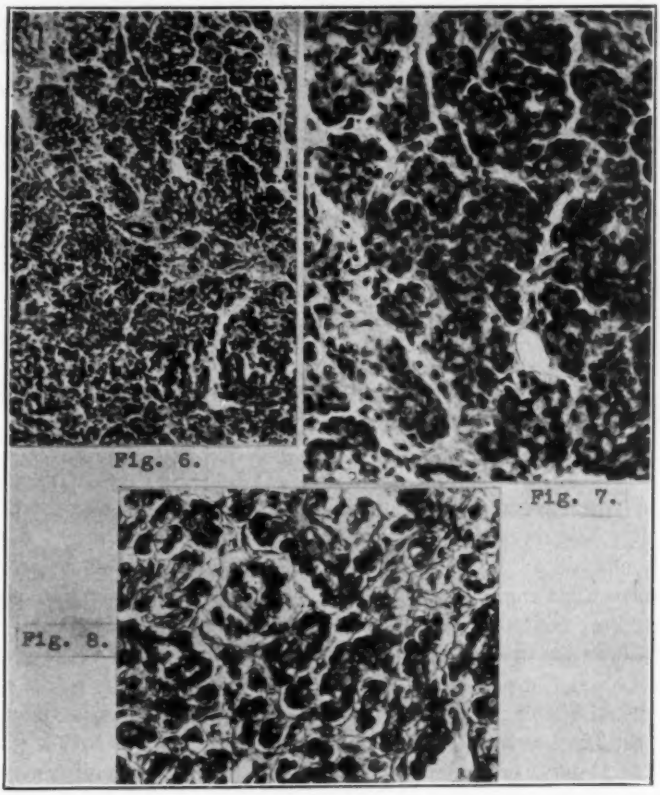

Fig. 6.—Case 3. Pancreas. Note the increase in connective tissue. (Van Gieson preparation, ×80.)

Fig. 7.—Case 3. Pancreas. Note the large cellular masses without the formation of regular acini. (Iron-hematoxylin-eosin preparation, ×250.)

Fig. 8.—Case 3. Pancreas. Note the dense reticulum fibers. (Reticulum stain, ×300.)

Liver: The cytoplasm of the parenchymal cells throughout the liver showed many large fat globules and also many minute fatty droplets. The changes seemed more pronounced in the region of the central zones but were present throughout.

Pancreas: Hematoxylin-eosin stains revealed a distinct new formation of connective tissue throughout the pancreas which, however, was far less pronounced than in Cases 1 and 2. The lobules were clearly recognizable in many fields, and

only in some sections were the acini traversed by connective tissue. The pancreatic cells throughout appeared smaller than normal but revealed very prominent nuclei. The cytoplasm in many fields was indistinct, and the differentiation between individual cells was difficult. In several instances, masses of nuclei of pancreatic parenchyma appeared as a syncytium. The lumina of the tubuli in many fields were indistinct. The islands of Langerhans were clearly recognizable. They seemed larger than normal but showed no changes. The ducts throughout the sections were surrounded by newly formed connective tissue, which occasionally revealed a moderate number of lymphocytes and very few polymorphonuclear leucocytes. Some of the ducts were dilated and contained desquamated cells, but no concrements were noticeable. The van Gieson stain revealed a new formation of connective tissue, in many fields separating the tubuli from one another. The changes were much more severe than could have been judged from the hematoxylin-eosin stain. A large amount of reticulum fibers could be demonstrated by the silver stain. These fibers often completely encircled the individual parenchymal cells. No spirochetes were found.

Small Intestines: Sections taken from the small intestines revealed many lymphocytes and plasma cells, and occasional polymorphonuclear leucocytes infiltrating the mucosa and submucosa. There was a slight new formation of connective tissue in the submucosa, particularly pronounced in the ileum.

Suprarenals, Thymus, annd Thyroid: Sections of these organs revealed no histopathologic changes.

The main pathologic diagnosis was: bronchopneumonia, fibrosis of the pancreas, nephrolithiasis, multiple diverticula of the stomach, chronic gastroenteritis, and fat infiltration of the liver (diffuse).

DISCUSSION

The postmortem findings in these three instances were strikingly similar. The autopsies revealed bronchopneumonia of recent development, chronic enteritis, and severe changes in the pancreas in every instance. The cause of death was the bronchopneumonia. In view of the general malnutrition it is easily understood why the infants died of the bronchopneumonia, even though it was not very extensive in one instance.

Unusual histologic findings in the alveoli of the lungs in these cases were the large monocytic cells which were filled with fat. It is possible that the presence of the large phagocytes filled with fat signifies metabolic changes affecting particularly the fat metabolism.

The thymus, thyroid, and suprarenals showed no gross or histologic changes in any of the cases. Schick and Wagner,[16] who found marked atrophy of the thymus, suprarenals, and pancreas, believed that in instances of celiac disease it was an "anatomically proved fact that glands of internal secretion which are in close relationship to digestion are primarily atrophic." They coined the term "atrophia pluriglandularis digestiva." Their findings, however, could not be confirmed by Fanconi,[28] Bloch,[29] and others. We also could find no evidence of atrophy of the thymus, thyroid, and suprarenals.

Chronic lesions were found in the intestinal tract, principally affecting the small intestines. In none of our cases, however, were the changes very severe or apparently of long duration. It is, therefore, doubtful that these lesions, though present in every instance, were the cause of celiac disease. It seems more likely that they were the result of changed intestinal contents and secondary infection. There were no ulcers, no scars, but a chronic catarrhal inflammation, which in some instances could not have been diagnosed without a histologic examination. It would be difficult to understand why such lesions should lead to the significant wastage of fat.

The seemingly enlarged jejunum which was encountered in the second case may be explained on the basis of the nutritional disturbance of long duration (Mautner and Lehndorff[3]).

Grossly the pancreas showed no noteworthy changes in any of the cases. It was slightly firmer than normal in one instance, but not sufficiently to attract special attention to it. The pancreatic ducts were not dissected grossly. Histologically, the changes in the pancreas were marked. A severe fibrosis was encountered in two instances, with dilated ducts and seemingly large islands of Langerhans, some of which also revealed an increase of connective tissue. Scattered throughout was a slight lymphocytic infiltration. In Case 3 the changes as encountered in the hematoxylin-eosin preparations were much less severe, and only by the use of special staining methods, a distinct new formation of connective tissue and reticulum often encircling parenchymal cells was encountered. Inflammatory cells were not numerous. This may indicate that the inflammation—provided that the fibrosis was the result of a primary inflammation—had subsided. It is likewise possible that the fibrosis was not the result of a primary acute inflammation but followed a primarily chronic irritation such as the closure of the duct. In addition to the marked fibrosis, the pancreas revealed a dilatation of the ducts in every instance, with periductile fibrosis and relatively large islands of Langerhans. In the first two instances, concrements were also demonstrable within the ducts.

Syphilis as the cause of pancreatic changes could be ruled out. Neither were the histologic changes suggestive of syphilis nor were spirochetes demonstrable. While it may be possible that primary concrements in the ducts which were found in the first two instances could explain the changes in the pancreas, we have no proof that the concrements were primarily present. It is likewise possible, however, that because of primary inflammatory changes of the smaller ducts, with closure of some and dilatation of others, concrements were formed secondarily.

In all three instances, evidence of regeneration of the pancreas was demonstrated by the presence of mitotic figures and by the appearance of syncytial cell masses in the pancreas in the third case, which showed the least change. It seems likely that in this case the pancreatic

parenchyma regenerated but the fibrosis still persisted. The first two infants died before the regeneration had taken place, but it is likewise possible that the changes in these instances were so severe that complete regeneration could not have occurred. It may be mentioned in this connection that Gruber,[33] summarizing the evidence for regeneration of the pancreas, stated recently that regeneration of the pancreas is a proved fact.

Parsons[3] stated that "in two or three cases some excess in fibrous tissue or small cell infiltration around the ducts of the pancreas" was found in instances of celiac disease. On the other hand, he stated that "the finding after much scratching about of some small grains of reward in the shape of an alteration in a few cells does not seem sufficient to justify an exalting cackle." From the point of view of the morphologist, however, it must be stated that excess in fibrous tissue and small cell infiltration are important. While these changes may seem insignificant at the time of examination, they constitute a document of a past insult and indicate that more severe lesions which have subsided were present some time ago. It is conceivable that the initial lesions subsided and only scars remained here and there, while other portions of the pancreas regenerated. It must be conceded that other cases of celiac disease, showing what was interpreted as slight changes by the use of the hematoxylin-eosin stain, also fall into this group.

Even if the pancreatic changes were the prime factor in the production of the clinical symptoms, recovery is explainable on the basis of the ability of the pancreas to regenerate acini and islets.

It is extremely difficult to decide whether a difference exists between primary pancreatic disease in infancy and the clinical picture of celiac disease or whether both are identical. Burghard's,[34] Gross's,[25] and Passini's[10] cases which revealed severe changes in the pancreas are regarded as examples of celiac disease. The changes in the pancreas in Gross's case were almost identical with those seen in our first two cases. In our opinion the most outstanding clinical symptoms of celiac disease, namely, the wastage of fat, can be explained on a primary pancreatic disorder. Because of the changes of the pancreas, we believe that it is also possible to correlate the changes in the carbohydrate metabolism in these cases on the basis of a pathologic pancreas. The hypophysis, unfortunately, could not be examined.

It may be mentioned in this connection that Gross[25] and, also, Nakamura[35] stated that systematic examination of the pancreas in children revealed that atrophy of the pancreas may occur in instances of diseases of the gastrointestinal tract and in acute and chronic toxic conditions. Also, Parsons[3] remarked that the changes in the pancreas "are either due to secondary infection or are the result of malnutrition." On the other hand, however, Gross,[25] and likewise Nakamura[35] stressed

that a primary disease of the pancreas may lead to severe malnutrition of the patient. Gross's[25] case and our three cases, we believe, belong to this latter group.

We are well aware of the fact that instances of celiac disease are described in the literature, which reveal chronic diseases of the gastrointestinal tract but no changes in the pancreas. If, by the use of special staining methods, it is not possible to demonstrate fibrosis in the pancreas, then it must be conceded that the symptom-complex of celiac disease has not one definite pathologic entity. Our series, comprising only three instances, is too small to permit generalization. Because of our findings we must insist, however, that in every instance of celiac disease the pancreas should be studied with the before mentioned special methods before pronouncing it normal.

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ATHLETIC PERFORMANCE AS A FUNCTION OF GROWTH: SPEED IN SPRINTING

H. Gray, M.D., and Frederick J. Daly
San Francisco, Calif.

AMONG the many problems of physiology basic to clinical medicine to which investigators in recent years have devoted so much attention, those of metabolism and growth have come to occupy an increasingly important place in the interest of pediatricians. The various aspects of growth in particular have been extensively studied and in many instances found to be susceptible of orderly analysis and even reduction to mathematical formulas. This is true of both the static and of the dynamic aspects of growth: of size of the body and its parts and of its faculties or functions. Of the latter, speed in sprinting is an important representative and forms the subject of the present report.

In sprinting the tempo is important because physiologically the "quickest way to reach the winning post is to take at the outset that speed which will just produce exhaustion at the goal and keep that speed throughout the course. The penalty for raising the speed at any part would be a degree of untimely exhaustion far outweighing the benefit gained." (Kennelly.[1]) The distance divided by the time may therefore be regarded as the individual's optimum speed for the particular event. It follows that for other distances that individual's optimum may be better. Furthermore, if we pick out the fastest speed recorded in any competitive event (namely, 9.906 meters per second in the 130-yard record made in 1911), we obtain a value which is better, because it is a human rather than an individual optimum. In its turn even this value is less than the maximum speed so far recorded for a running man at any moment, namely 10.48 meters per second, between 45 and 50 yards, as measured with electric coils along the course. (Hill and his pupils, 1927.[2]).

Observations.—The runners were boys from the ages of nine years to twenty years and six months at the Tamalpais School in San Rafael, Calif. The track was of firm grass, on a slight slope, such that the running time for a number of boys was the same as on a cinder track; in fact the fastest performer did slightly less well than on cinders. The starting signal was "get ready," then a gun. The observations were made by F. J. D., whose experience in varsity athletics and as a coach extends over many years. Ages were recorded to the nearest

From Stanford University School of Medicine, aided by the Rockefeller Fluid Research Fund.

month (e.g., a boy of 9 years 4¾ months was recorded as 9 years 5 months), and the ages were tabulated in groups of six months, beginning with 9 years to 9 years 6 months, midpoint at 9.25 years. Times were taken in seconds and fifths (e.g., 9 and ⅕ meant 9 and ⅕ but less than 10 seconds); these observations were converted into decimals (e.g., 9.8 seconds), and grouped in class-intervals of 0.4 second, beginning with the class 9.6 and less than 10.0, midpoint at 9.8 seconds. The averages and other reduced statistics on the 992 observations are listed in Table I.

Spot Chart of Observations.—The raw data and also the averages for age are plotted in the diagram: age along the horizontal axis, time on the right vertical scale, and on the left vertical is speed in meters per second. The solid dots emphasize the notable variation in performance among boys within any six-months-age-group. The circles represent the averages for the age-groups, and from now on we shall deal mainly with the averages. The next step is to smooth them, and this has been done by a line through the field of plotted points; hence for any given boy we may find his age on the baseline and read up to the curve and then sideways to find the average, or so-called "normal," running time on the right vertical scale or speed on the left.

The crossed averages, which stray so markedly from the stream, are explicable as follows. The high value at 20.25 years represents two boys who were exceptional, not ordinary performers. The three values below the right end of the curve, namely for 19.75, 19.25, and 18.75 years, reflect the noteworthy tendency of some boys in the last year or two of school to act bored with tests and let down in effort; the same phenomenon is found in other tests. After these four crossed circles are omitted there remain nineteen means covering 966 observations for further analysis.

Theory for the Curve.—In order to graduate the observations for practical use, a trend line was sketched freehand. It took the form of an elongated "S." Now growth phenomena, too many to review here (though traceable through the references at the end of this paper), have been thought to fit either a logistic or a Gompertz curve, either of which has the convenience of a small number of constants. Formulas with various assumptions for the constants were tested (on Wilson's[3] grid paper for the logistic, on Courtis's[4] grid for the Gompertz), until an equation was found which nearly coincided with the tentative freehand curve and was then substituted in the graph. This preferred law was the so-called autocatalytic, or speaking more generally and without conjecture as to chemical kinetics, the logistic. Indeed it is presented mainly as a neat and useful interpolation formula. Its limitations have been acutely analyzed by Wilson and Puffer 1933,[5] by Kavanagh and Richards 1934.[6]

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TABLE I

100-YARD DASH—STATISTICS ON 992 OBSERVATIONS

AGE		NUMBER OF OBSERVATIONS	TIME SECONDS PER 100 YD. (91.44 M.)				
CLASS LIMITS	MIDPOINT		MEAN	PROBABLE ERROR OF MEAN	STANDARD DEVIATION	COEFFICIENT OF VARIATION	SPEED IN METERS PER SECOND
YEARS AND TENTHS	YEARS	f	M	PE	SD	CV	
			SEC.	SEC.	SEC.	%	M./SEC.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
9.0 – 9.5	9.25	6	16.9	0.22	0.81	4.8	5.40
9.5 – 10.0	9.75	8	15.9	0.23	0.96	6.0	5.74
10.0 – 10.5	10.25	10	16.7	0.29	1.35	8.1	5.48
10.5 – 11.0	10.75	28	15.9	0.14	1.10	6.9	5.77
11.0 – 11.5	11.25	29	16.4	0.17	1.35	8.2	5.57
11.5 – 12.0	11.75	46	15.5	0.12	1.22	7.9	5.90
12.0 – 12.5	12.25	40	15.3	0.11	1.00	6.5	5.97
12.5 – 13.0	12.75	53	15.1	0.13	1.39	9.2	6.06
13.0 – 13.5	13.25	54	15.0	0.12	1.30	8.9	6.22
13.5 – 14.0	13.75	66	14.3	0.13	1.52	10.6	6.37
14.0 – 14.5	14.25	87	13.9	0.09	1.29	9.2	6.57
14.5 – 15.0	14.75	71	13.5	0.13	1.58	11.6	6.76
15.0 – 15.5	15.25	98	13.3	0.09	1.34	10.0	6.85
15.5 – 16.0	15.75	84	12.8	0.09	1.25	9.7	7.14
16.0 – 16.5	16.25	85	12.8	0.10	1.37	10.7	7.15
16.5 – 17.0	16.75	67	12.4	0.10	1.24	10.0	7.39
17.0 – 17.5	17.25	65	12.0	0.08	1.01	8.4	7.64
17.5 – 18.0	17.75	44	12.3	0.11	1.09	8.9	7.44
18.0 – 18.5	18.25	25	11.9	0.12	0.88	7.4	7.66
18.5 – 19.0	18.75	16	12.4	0.17	1.00	8.0	7.37
19.0 – 19.5	19.25	6	12.1	0.21	0.78	6.4	7.56
19.5 – 20.0	19.75	2	12.5				7.32
20.0 – 20.5	20.25	2	10.6				8.63

For visual comparison with other material following the logistic law, it is convenient to follow Yule's[7] scale and proportions for the universal logistic, with *age* on the baseline calibrated in tau units, Greek letter τ, multiples of the standard interval, measuring to the left or right (minus or plus) from the age of inflection; and on the vertical scale *speed* expressed first in meters per second and then converted into percentage of an assumed maximum speed at completed growth.

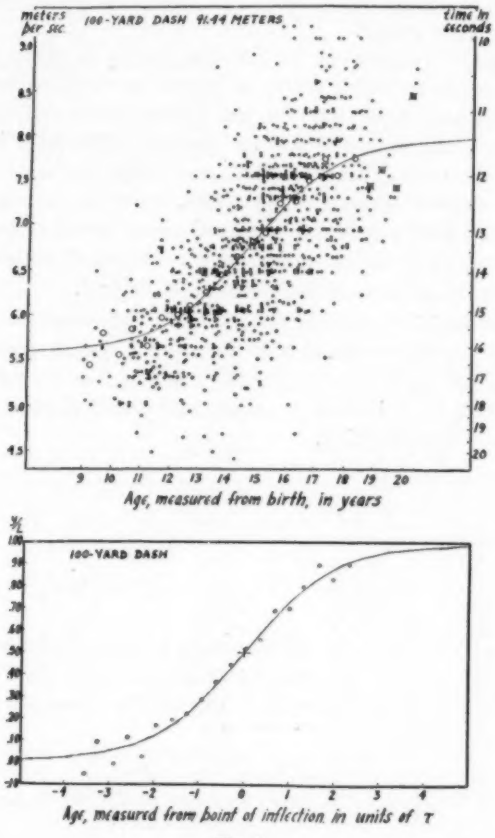
meters per sec.
100-YARD DASH 91.44 METERS
time in seconds
Age, measured from birth, in years
100-YARD DASH
Age, measured from point of inflection in units of τ

Fig. 1.

For the present material this upper asymptote is the maximum expected for the average performance of a group of boys, not the maximum approached by the group's fastest individual. When observations have been obtained on such an individual runner, say from the age of nine to the age of twenty, his growth in speed will follow a different curve; and if that curve be a logistic, it will certainly approach a higher maximum than that of the present group curve. Numerically that in-

dividual's maximum or upper asymptote will exceed the group's asymptote 8.04 m./sec. but will lie much closer to the record speed made in 1910 in this event, namely 9.73 m./sec., though somewhat below the record speed in any competitive event, namely 9.906 m./sec. in the 130-yard dash in 1911 (see Kennelly 1926[8]) and more below 10.479 m./sec., "the greatest speed ever measured in a human runner in still air" (see Furusawa, Hill, and Parkinson 1927[2]).

Both scales in the lower graph correspond exactly to the respective scales in the upper graph.

The stream of observations in the spot graph is likely to give the reader an impression that a better fit would be obtained by a straight line, and a steeper slope; but the well-known occasional deceptiveness of such optical impressions is also in this case sufficiently indicated by the trend of the means, which in the lower graph are seen to lie closer to a sigmoid curve than to a straight line.

The circles in both graphs are not quite exact because after the drawings were completed the averages were recomputed as a check, with slight changes, which are correctly stated in Table I.

The present logistic equation fits the data when converted into speed = meters per second = 91.44/time in seconds, but it does not fit the original observations in seconds for the distance, nor would the time in seconds be fitted by a logistic equation with changed constants. These are distinctions worth noting.

The universal logistic $\frac{y}{L} = \frac{1}{1 + e^{-\tau}}$

becomes for the present speeds

$$\frac{y}{L} = \frac{Y - 5.400}{2.640} = \frac{1}{1 + e^{-0.557\ (X-14.7)}}$$

in which

X	= age from birth in years and tenths
X_1	= age of inflection = 14.70 years
Y	= speed = (distance in meters)/(time in seconds) = m./sec.
A	= upper asymptote of Y, here assumed after several trials as 8.040 m./sec.
d (Pearl)[9, 10]	= lower asymptote of Y, here assumed after several trials as 5.400 m./sec.
L (Yule,[7] Wilson)	= K (Pearl) = limit or maximum amount of growth *in the period* studied = A − d = 2.640 m./sec.
y	= Y − d
y/L	= percentage-saturation = percentage of speed at maturity
$\frac{n}{\sigma}$ (Wilson), $\frac{1}{a}$ (Yule)	= (rate of growth)/(standard deviation) = −0.557 by graphic method on Wilson's grid
tau, τ (Yule)	= $\frac{n}{\sigma}$ (X − X_1) = age, measured from age of inflection, and expressed not in years but in standard intervals of Yule.

Agreement of Observation With Theory.—The deviations of the observed means from the corresponding values on the curve of theory have been computed: $Y_o - Y_t = \Delta$, and these deltas treated in four ways which have been used by one or another of the investigators of the logistic. The results are satisfactorily small.

Root-mean-square-deviation $= \sqrt{\frac{\Sigma(\Delta^2)}{19}} = 0.098$ m./sec.

Weighted root-mean-square-deviation $= \sqrt{\frac{\Sigma\ (f.\ \Delta^2)}{966}} = 0.080$ m./sec.

Percentage-deviation of observation from theory $= \frac{\Sigma\left(\frac{100\,\Delta}{Y_t}\right)}{19} = 1.22$ per cent

Weighted percentage-deviation of observation from theory $= \frac{\Sigma\left(\frac{f.\ 100\,\Delta}{Y_t}\right)}{966} = 0.87$ per cent

Standards for Practical Use.—Athletic performance standards are commonly stated with regard to school grades. Now a given grade in

TABLE II

100-YARD DASH: PREDICTED STANDARD FOR PRACTICAL USE

AGE IN YEARS AND TENTHS	EXPECTED TIME IN SECONDS AND TENTHS (LONGEST TIME FOR GROUP INDICATED)				
	FASTEST 2% OF BOYS	FASTEST 16% OF BOYS	FASTEST 50% OF BOYS (AVERAGE OF ALL)	FASTEST 84% OF BOYS	FASTEST 98% OF BOYS
(1)	(2)	(3)	(4)	(5)	(6)
9.0	15.0	15.8	16.6	17.4	18.2
9.5	14.8	15.6	16.5	17.4	18.2
10.0	14.5	15.4	16.4	17.4	18.3
10.5	14.1	15.2	16.2	17.3	18.3
11.0	13.7	14.9	16.0	17.1	18.3
11.5	13.4	14.6	15.8	17.0	18.2
12.0	13.0	14.3	15.6	16.9	18.2
12.5	12.5	13.9	15.2	16.6	17.9
13.0	12.1	13.5	14.9	16.3	17.7
13.5	11.6	13.0	14.5	16.0	17.4
14.0	11.1	12.6	14.1	15.6	17.1
14.5	10.7	12.2	13.8	15.4	16.9
15.0	10.4	11.9	13.4	14.9	16.4
15.5	10.2	11.6	13.0	14.4	15.8
16.0	10.1	11.4	12.7	14.0	15.3
16.5	10.1	11.3	12.5	13.7	14.9
17.0	10.0	11.1	12.2	13.3	14.4
17.5	10.0	11.1	12.1	13.2	14.2
18.0	9.9	10.9	11.9	12.9	13.9
18.5	9.9	10.9	11.8	12.7	13.7
19.0	9.9	10.8	11.7	12.6	13.5
19.5			11.6		
20.0			11.6		
20.5			11.5		

The standard deviations used to determine percentiles in this table were read from a smooth curve drawn on a plot (not reproduced) of the computed standard deviations. The range is left vacant in the last lines because the small N's make the sigmas unreliable.

one school will include an age range varying both with that school's scholarship standards, which vary geographically, and with the students' intelligence quotients, which vary according to social, economic and other conditions. More logically therefore, athletic standards should be referred to age. Observations were accordingly collected in a private school in California, the averages graduated mathematically by methods presented above and the resultant standards arranged in Table II for practical convenience of athletic coaches. The predicted values are stated at exact years and half-years (instead of at 0.25 yr. and 0.75 yr., necessarily used in reducing the raw data). Expected performance at fractional ages can be interpolated or, if desired, computed from the formula. Besides the average there are also tabulated certain lower and upper borders which permit any particular boy to be assessed as either handicapped or superior.

The only age standards for sprinting-speed seem to be the Philadelphia "public school age aim charts," quoted by Bovard and Cozens[11] in 1930. In the 100-yard dash our private school boys were faster. By how much exactly we cannot say because we do not find in that reference whether age was recorded to nearest or to last birthday.

CONCLUSIONS

1. The rate of speed in running of which schoolboys are capable has been shown to be correlated with age and, hence, to be one of the phases of general growth which is susceptible to mathematical treatment like growth in size of the body as a whole and of its various organs, systems, and activities.

2. An analysis of the data for the 100-yard dash obtained from 992 tests of schoolboys from nine to twenty years of age shows that average speeds in seconds when calculated for and plotted against years of age form a symmetrical flattened S-curve, such as is characteristic of several forms of growth. From this curve a mathematical formula has been computed, agreeing satisfactorily with the observations which in mathematical terminology is a logistic, and in physiologic terminology an autocatalytic, curve. The feature of this kind of growth is that the annual gains, instead of becoming smaller year by year as appears true of some traits, *increase* up to puberty and thereafter decrease, so that these gains plotted against age look like the bell-shaped curve of probability. Speed in sprinting has, therefore, been shown to be an aspect of growth susceptible of fairly precise prediction.

3. A table of standards, based on the present rather large series of observations for the approximate period of late childhood and of adolescence is presented which may be of practical service to school physicians and athletic directors.

For mathematical advice we are greatly indebted to Dr. Holbrook Working.

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HEMORRHAGE AND SUBSEQUENT CALCIFICATION OF THE SUPRARENAL

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HEMORRHAGE in the suprarenal gland occurs relatively frequently in infants and children. There are a number of causes. This study was prompted by the clinical observation of a patient with massive suprarenal hemorrhage, in whom, at postmortem, calcification was found in the old blood clot.

In the newborn massive hemorrhage of the suprarenal has been described.[1-9] It is also seen in older children and adults.[7, 8, 10-23] The clinical course in the newborn has been described as follows: shock, listlessness, refusal of food, rapid respiration, rapidly developing anemia, distention, bogginess of the abdomen with or without bluish discoloration, and occasionally a palpable mass. Pyrexia was observed by some.[6, 7, 22] Cures were reported by transfusions,[5] hormone therapy,[6, 23] and operation.[2] The etiology was given as (a) probably part of hemorrhagic disease of newborn; (b) difficult delivery (breech); (c) Schultz method of resuscitation; (d) increased pressure in the inferior vena cava and suprarenal vein.[5, 6, 7, 8] Smaller hemorrhages which are probably incidental findings and not the primary cause of death are fairly frequent.

Severe sepsis causing suprarenal hemorrhage has been recorded.[7, 10-17] It may be due to thrombosis of suprarenal veins, emboli, or toxic damage to the gland. This seems to be the most frequent cause after the newborn period.

In patients with fatal burns, hemorrhage in the suprarenal is quite common.[8, 15, 19]

Suprarenal apoplexy in adults is described and has nearly always been associated with an infection.[10, 11, 16, 17, 18] Materna[22] showed in some of the patients dying from suprarenal hemorrhage that there was an excess of adrenalin in the blood stream causing an adrenalin toxemia.

Calcification of the suprarenal glands has been observed in patients with Addison's disease[24-27] in whom there has been tuberculosis of the suprarenal followed by insufficiency of the gland. Calcification is reported by a few authors as occurring in children.[25, 27, 29] Adami and Nicolls[30] noted it in four patients over forty years of age in whom there was no tuberculosis, and they considered it may have followed a suprarenal hemorrhage at birth. Marine[28] reports calcification of

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the suprarenals in cats, usually following distemper. The symptoms were similar to insufficiency of the gland as observed in the animals surviving double suprarenalectomy for three weeks.

Banting and Gairns[31] found in adrenalectomized dogs that injection of adrenalin-free cortex prolonged life. Also they noted that Ringer's solution was more effective than any other intravenous solution.

The material for this study is derived from the records of forty-three infants and children in whom suprarenal hemorrhage was found at postmortem. These have been observed during the last fifteen years and the frequency is somewhat greater than was expected. Suprarenal hemorrhage was found forty-three times in 3,637 consecutive postmortems, an incidence of 1.19 per cent; fifteen occurred in newborn infants; and twenty-eight, in older infants and children. The data may be found in Table I.

NEWBORN GROUP

Of the cases in this group only one was diagnosed clinically (Case 41). In this case labor was difficult; the infant suffered collapse, irregular respirations, and weak pulse. A mass was felt in the left flank. This patient was also suffering from intracranial hemorrhage and, in spite of repeated transfusions, died. Six of the fifteen were prematurely born infants; the type of labor was not recorded in the majority, but records of four showed difficult delivery (Cases 2, 7, 41, and 42). Ten of the fifteen were brought to the hospital under one week of age, and all died shortly after admission. In the postmortem examinations very few had uncomplicated suprarenal hemorrhage. Cases 2, 3, 7, 9, 10, 11, 13, and 42 showed the smallest number of associated conditions, and if one analyzes the clinical findings in these, the symptoms and signs divide into those of (a) collapse and (b) hyperirritability. On the one hand, there was collapse, cyanosis, irregular gasping respiration, weakness, listlessness, subnormal temperature, lack of suckling, and in some the unconfirmed clinical diagnoses of bronchopneumonia, sepsis, intracranial hemorrhage, and alimentary intoxication were made. The other clinical picture was one of twitching of the muscles, screaming, convulsions and fever. The unconfirmed clinical diagnosis in these (Cases 7, 10, and 42) was intracranial hemorrhage. All the cases being considered, the symptoms and signs fall into these two divisions, but the other conditions from which the patient suffered may have been contributory.

In three patients (Cases 2, 41, 42—Figs. 1 and 2) a mass was observed on palpation of the abdomen, though in the first it was thought to be liver. There were four instances in which the mass was large enough to have been easily palpable. In ten of the fifteen cases, the hemorrhage was sufficiently extensive to destroy the structure of one or both glands and so disorganize the parenchyma that it would not seem possible for the usual function to continue.

TABLE I

Suprarenal Hemorrhages in Newborn Infants

CASE NO.	AGE ON ADMISSION	CLINICAL COURSE	CLINICAL DIAGNOSIS	ANATOMICAL FINDINGS	MICROSCOPIC FINDINGS
1 Male	2 wk.	Child screamed 8 hr. before admission; collapsed; died day after admission.	Prematurity, peritonitis.	Omphalitis, peritonitis, pulmonary edema. Small hemorrhages in both suprarenals. *Streptococcus mucosus capsulatas* recovered from umbilicus and peritoneum.	Small recent cortical and medullary hemorrhages.
2 Male	3 days	Difficult resuscitation; failure to take food. Collapse, breathing and gasping irregularly. Liver enlarged. Fine crepitations in lung.	Bronchopneumonia, septicemia.	Massive right suprarenal hemorrhage size of a small orange. Peritoneal hemorrhage.	No normal suprarenal tissue left. Cells widely separated by extensive hemorrhage.
3 Female	4 days	Prematurity. Pemphigus neonatorum; fever. Child given an exsanguination transfusion and died shortly.	Prematurity, septicemia, impetigo.	Bilateral suprarenal hemorrhage — capsule distended with dark blood clot. Bronchopneumonia.	Cortex and medulla disorganized by extensive recent hemorrhage.
4 Female	17 hr.	Premature baby with subnormal temperature; died shortly after admission.	Prematurity.	Atelectasis. Small hemorrhage into suprarenals; patent foramen ovale. Petechial hemorrhage into lungs, heart, and liver.	
5 Male	1 day	Premature one-day-old baby admitted with a subnormal temperature; died shortly after admission.	Prematurity, congenital heart disease.	Pulmonary atelectasis, intracranial hemorrhage, bilateral hemorrhage in suprarenals (1 dram of blood clot in each). Patent ductus arteriosus and foramen ovale.	
6 Male	3 wk.	Discharging eyes since birth. Temperature rose very high after admission, to 108° F., and child died same day.	Prematurity, ophthalmia neonatorum.	Intracranial hemorrhage, bronchopneumonia, otitis media, bilateral suprarenal hemorrhage.	Suprarenal gland disorganized by recent hemorrhage.

*Cases 41 and 42 also are of the newborn group.

TABLE I—CONT'D

7 Female	2 days	Twitching of limbs, difficult labor. Decompression was done. Nothing found; baby died on table.	Cerebral hemorrhage.	Decompression wound of cranium. Few petechial hemorrhages in the cerebral cortex. Hemorrhage into both suprarenals from 1 to 2 drams of blood clot.	Only thin layer of suprarenal cortex remained. Medulla filled with large blood clot.
8 Male	2 days	Vomiting, and mucus in throat. Barium by mouth found in lung. Child vomited while in hospital. Died in 2 days. No fever.	Tracheoesophageal fistula.	Intracranial hemorrhage. Bronchopneumonia. Massive hemorrhage with destruction of suprarenals.	Practically the whole parenchyma of the suprarenal was destroyed. Large blood clot in medulla.
9 Male	12 hr.	Premature infant, 12 hours old, died 24 hours after admission.	Prematurity.	Atelectasis, patent ductus arteriosus and foramen ovale. Left suprarenal, small hemorrhage; right had 1 dram of blood.	
10 Female	1 day	Screaming, convulsions, and twitching of muscles, temperature 100° F. Died in 1 day.	Cerebral hemorrhage.	Pulmonary hemorrhage, suprarenal hemorrhage, right, 5 c.c.; left, petechial.	Right suprarenal greatly disorganized by hemorrhage.
11 Male	9 days	Vomiting blood, weakness and pallor, inability to nurse properly, increasing since birth. Transfusion. Died next day.	Hemorrhage of newborn.	Hemorrhage (gastrointestinal tract; lungs; suprarenals).	Suprarenal tissue, with exception of thin zone of cortex, destroyed by hemorrhage which had clotted and showed early organization and phagocytosis of hemosiderin.
12 Male	5 days	Taking feeding poorly since birth. Feeble cry. Cyanosis one day. Died day after admission.	Intracranial hemorrhage; omphalitis.	Sepsis neonatorum (omphalitis). Septicemia, *Staphylococcus aureus*. Hemorrhage in suprarenals.	Diffuse hemorrhage in suprarenals not altering structure to any extent.
13 Female	10 days	Diarrhea for 48 hours, child admitted in collapse, heart rapid. Dehydrated and blue, put in oxygen tent, and transfusion given. Died day of admission.	Alimentary intoxication, bronchitis.	Recent hemorrhage disorganizing left suprarenal.	

TABLE I—CONT'D

Infection as Probable Cause of Suprarenal Hemorrhage

CASE NO.	AGE ON ADMISSION	CLINICAL COURSE	CLINICAL DIAGNOSIS	ANATOMICAL FINDINGS	MICROSCOPIC FINDINGS
14 Male	11 mo.	Loss of appetite, cough, irritability, lethargy, difficult feeding problem. Died some days after admission.	Infectious intoxication; nasopharyngitis; otitis media.	Chronic pyelonephritis. Suprarenal hemorrhage (small).	Small diffuse medullary hemorrhage showing phagocytosis of hemosiderin. No fibrosis or calcification.
15 Female	3½ mo.	Diarrhea 4 days, vomiting 2 days. Drowsiness day of admission. No improvement; fever developed; petechial hemorrhages on chest. Died 20 days after admission.	Septicemia.	Septicemia, hemorrhagic gastroenterocolitis. Suprarenal hemorrhage.	Recent diffuse hemorrhage into cortex of suprarenal. Congestion of medulla.
16 Male	5 mo.	Losing weight 7 weeks. Furunculosis 4 days. Admitted as an atrophic infant with otitis media. Died 7 days after admission.	Decomposition, furunculosis; fermentative diarrhea; otitis media.	Bronchopneumonia; otitis media. Hemorrhage into left suprarenal, from ½ to 1 dram of blood.	Recent localized hemorrhage into left suprarenal.
17 Male	3 yr.	Cough and fever 7 weeks. Listless 2 days. Bronchopneumonia and septicemia, cellulitis of cheek 2 days before death, petechial hemorrhages. Died 9 days after admission.	Bronchopneumonia; septicemia; otitis media.	Septicemia; bronchopneumonia. Otitis media, cellulitis, suprarenal hemorrhage (right).	Recent diffuse hemorrhage into cortex and medulla of right suprarenal.
18 Female	14 mo.	Vomiting 1 day. Diarrhea and rapid breathing, coughing. Came in moribund with temperature 105° F., and died.	Influenza; infectious intoxication.	Blotchy red rash and petechial hemorrhages on trunk. Hemorrhage into suprarenals. Blood and lung cultures negative.	Recent, diffuse bilateral hemorrhage into cortex and medulla.

TABLE I—CONT'D

19 Female	8 mo.	Child had alimentary intoxication 3 weeks before admission, developed gangrene of buttocks and pneumonia, died 2 days after admission.	Bronchopneumonia; septicemia; gangrene of buttocks.	Thrombosis (lateral and straight sinuses; cerebral veins; inferior vena cava). Bronchopneumonia, septicemia. Gangrene of buttocks. Suprarenal hemorrhage, right; renal infarction.	Right suprarenal showed medulla filled with blood clot and cortex broken up by hemorrhage.
20 Female	3 mo.	Discharging nose 5 days; twitchy; fever and vomiting 3 days. Drowsy and refusing food 1 day. Admitted in moribund condition. L.P. revealed purulent spinal fluid.	Meningitis (hemolytic streptococcus).	Purulent meningitis. Cong. cystic kidney. Hemorrhage into suprarenal. Septicemia.	Moderate diffuse recent hemorrhage in medulla.
21 Female	4¾ yr.	Erysipelas for 10 days before entry. Mongolian idiot. Erysipelas spread and child finally died.	Erysipelas; Vincent's angina; mongolism.	Septicemia, fibrinous pleurisy. Purulent pericarditis; serofibrinous peritonitis; acute nephritis. Mongolism. Suprarenal hemorrhage.	Small recent diffuse hemorrhage in medulla and cortex.
22 Female	12 mo.	Cough, loose stools; drowsy 3 months. Admitted with acute upper respiratory infection, developed bronchopneumonia and pyelonephritis; died 10 days after admission.	Pyelitis; bronchopneumonia.	Otitis media. Mastoiditis, bronchopneumonia. Pyelonephritis. Recent left suprarenal hemorrhage (½ dram).	
23 Male	2 yr.	Came in with loss of appetite, fever, vomiting, loss of consciousness. Was convulsive and dehydrated with high fever. Died a few hours after admission.	Bilateral otitis media, nasopharyngitis, infectious intoxication.	Generalized thrombosis of cerebral veins. Acute encephalitis with softening of basal ganglia. Double otitis media and mastoiditis. Hemorrhage into right suprarenal.	Thrombosis of right suprarenal vein and recent cortical hemorrhage.

TABLE I—CONT'D

Infection as Probable Cause of Suprarenal Hemorrhage

CASE NO.	AGE ON ADMISSION	CLINICAL COURSE	CLINICAL DIAGNOSIS	ANATOMICAL FINDINGS	MICROSCOPIC FINDINGS
24 Male	28 days	Premature baby developed a cold, vomiting, diarrhea and loose stools; died 3 days after admission.	Prematurity; infectious intoxication.	Bronchopneumonia, pleurisy, otitis media; bilateral suprarenal hemorrhage, more marked in left.	
25 Female	5 wk.	Head cold, irritability, drowsiness, vomiting; died in admitting room.	Intestinal intoxication; meningococcus septicemia.	Meningococcus septicemia. Generalized peritonitis; bilateral pleural effusion, septic pneumonia. Petechial hemorrhages in skin; bilateral suprarenal hemorrhage.	The whole gland was disorganized by extensive diffuse hemorrhage.
26 Female	9 yr.	Fever, drowsiness; vomiting 17 hours. Delirium and purple blotches 3 or 4 hours. Child died shortly after admission with fulminating cerebrospinal meningitis.	Meningococcus meningitis; meningococcus septicemia.	Meningococcus septicemia and meningitis. Petechial suprarenal hemorrhages. Purpuric spots on skin.	Foci of hemorrhage throughout the suprarenals.
27 Male	7 mo.	Child had summer diarrhea for 5 wk. before admission. On admission was toxic and dehydrated, running septic type of fever. Transfusion and treatment for alimentary intoxication given. Developed bronchopneumonia and died.	Acute intestinal intoxication. Bronchopneumonia.	Hemorrhage into left suprarenal. Bronchopneumonia.	Recent left medullary hemorrhage.
28 Male	5 mo.	This child had fulminating meningococcus meningitis; was well until 16 hours before admission. Died 1 hour later.	Meningococcus meningitis.	Meningococcus septicemia and meningitis. Purpura. Bronchopneumonia. Massive suprarenal hemorrhage.	Whole gland disorganized by hemorrhage. Here and there scattered strands of adrenal tissue; otherwise nearly all blood clot.

TABLE I—CONT'D

Burns as Cause of Suprarenal Hemorrhage					
29 Female	3½ yr.	Burned and scalded. Was in a condition of shock on admission. Area of buttocks and thighs involved. This was tanned. Transfusion given. Day after, child looked well, pulse 148; 2 days later vomited blood; pulse 200, very listless and toxic. Died very suddenly.	2nd and 3rd degree burns.	Burns. Duodenal ulcer with hemorrhage. Bilateral suprarenal hemorrhage.	Right suprarenal had an extensive diffuse hemorrhage with some disorganization of tissue. The veins were thrombosed. Left showed extensive hemorrhage and destruction of the whole gland with hemorrhage into surrounding tissue.
30 Female	3½ yr.	Burns on abdomen and buttocks. Was quite toxic day after admission. Later had a convulsion and died.	Burns, toxemia.	Burns. No gross hemorrhage of the suprarenal.	Suprarenal hemorrhage involving whole medulla of one gland.
31 Female	3½ yr.	Admitted shortly after extensive burns of the trunk. Very restless, collapsed while area was being cleaned. Circulation always poor. Pulse not perceptible at wrists. B.P. 40; after adrenalin rose to 60. Child died of circulatory failure 18 hours after admission.	Burns.	Burns. Small suprarenal hemorrhage, left. Petechial hemorrhage in brain and myocardium.	
32 Female	9 yr.	Scalded with water. Child was toxic, cyanosed and definitely ill.	Burns, toxemia, sepsis.	Burns, duodenal ulcer. Gastric ulcers. Diffuse hemorrhage into suprarenal.	Extensive diffuse hemorrhage in both suprarenal glands with destruction of tissue.
Miscellaneous Causes of Suprarenal Hemorrhages					
33 Male	7 yr.	Child was injured in automobile accident. B.P. unvaried, 100-110 systolic. Pulse became very rapid. Decompression done. Child died.	Cerebral concussion. Fracture of skull.	Fracture of skull, laceration of brain, cerebral hemorrhage, petechial. Decompression wound. Suprarenal hemorrhage, right.	Considerable hemorrhage at one side of gland. Other portion appeared normal.

TABLE I—CONT'D

CASE NO.	AGE ON ADMISSION	CLINICAL COURSE	CLINICAL DIAGNOSIS	ANATOMICAL FINDINGS	MICROSCOPIC FINDINGS
34 Male	3½ mo.	Child, group II, transfusion from a universal donor (1919). Child became blue, collapsed, passed bloody urine.	Decomposition. Anaphylaxis following transfusion.	Petechial hemorrhages in lung. Hemoglobinuria. Serous fluid was blood stained. Hemorrhages into suprarenals.	Extensive diffuse hemorrhage into both cortex and medulla.
		Sequelae of Suprarenal Hemorrhage			
35 Male	3 mo.	Child showed irritability, crying, twitching, vomiting 2 days. Convulsion 1 day. Trousseau's sign positive. Died shortly after admission.	Rickets; tetany.	Suprarenals large, ½ size of kidney. Rickets. Otitis media.	Old hemorrhage, chiefly medullary, with organization; phagocytosis of hemosiderin.
36 Male	5½ mo.	Breech delivery, difficult. Hematoma of buttocks, depressed fracture. Difficult resuscitation. High rasping cry for 2 wk.; always been difficult to feed. Some beading of ribs. Developed otitis media, mastoiditis. Developed diarrhea and died.	Nasopharyngitis, double otitis media, mastoiditis, infectious intoxication.	Mastoiditis, otitis media. Bronchopneumonia. Purulent meningitis. Calcareous deposits in suprarenal (micro).	Suprarenals showed large phagocytic cells containing blood pigment. There were numerous areas of calcareous deposit.
37 Male	4¾ mo.	B. W., 8 pounds, normal labor. Always difficult to feed. Listless, developed an infection 3 days before admission and died following day. Complaint: vomiting, rapid respirations, and drowsiness.	General peritonitis, septicemia.	Peritonitis, septicemia, bronchopneumonia. Calcification of right suprarenal.	Right gland was larger than normal. Cortex appeared normal; medulla entirely replaced by calcareous deposits, fibrous tissue, and phagocytic cells filled with hemosiderin.

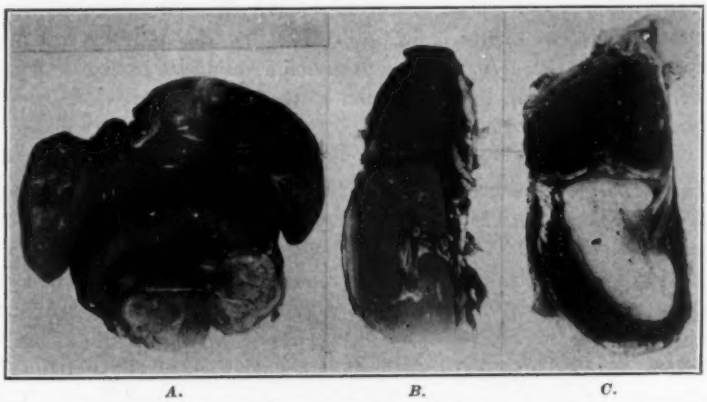
TABLE I—CONT'D

38 Male	9½ mo.	Screaming fits, frequently; anorexia 4 wk., developed bronchitis, had pus in urine on admission. *B. coli* cultured from urine. X-ray picture of abdomen showed calcareous shadows in region of kidney but were thought to be renal calculi. Child developed bronchopneumonia and died.	Pyelitis, bronchopneumonia, otitis media, ventral hernia.	Otitis media and mastoiditis. Bronchopneumonia. Calcareous deposits in right suprarenal, in gross, feeling as if stones were present.	Left gland showed veins thrombosed in medulla with some calcareous change and recanalization. Right contained many calcareous deposits and phagocytic cells with hemosiderin. Medulla all destroyed. Cortex only a thin shell.
39 Female	7 mo.	Recurrent attacks of irritability, fever, pallor, failure to gain, vomiting, 4 mo. Normal labor. Admitted with nasopharyngitis, otitis media and pyelonephritis. Child developed diarrhea and died 1 mo. after admission. X-ray pictures of abdomen showed irregular calcified areas in region of suprarenals.	Chronic pyelitis; otitis media, anemia; nasopharyngitis.	Otitis media, mastoiditis, subacute pyelonephritis. Thrombosis of inferior vena cava. Splenomegaly, calcification of both suprarenals.	Medulla and part of cortex had been replaced by calcareous deposits. In one there was the formation of osseous tissue with bone marrow. Hemosiderin was present in some of the phagocytic cells.
40 Male	17 mo.	Always feeding problem. Admitted with vomiting, convulsions, and drowsiness. Child was drowsy and had a peculiar irritable cry. Collapsed shortly after admission and died.	Tuberculous meningitis (not confirmed).	Calcareous deposits in both suprarenals. (No evidence of tuberculosis found in postmortem.)	Cortical cells normal, but structure altered by large old medullary hemorrhage showing hemosiderin and calcification.
41 Male	7 days	Breech delivery, forceps, difficult resuscitation, irregular shallow breathing. Not moving right side of body. Mass appeared under the chin; mass felt in abdomen; child pale. Transfusion, no recovery. Died three days later.	Hemorrhage of newborn. Left suprarenal hemorrhage. Hematoma of right cervical region.	Intracranial hemorrhage subarachnoid. Multiple small lung hemorrhages. Massive suprarenal hemorrhage left, small suprarenal hemorrhage right. Hematoma in cervical region.	Right showed marked diffuse hemorrhage with calcareous deposits. Left completely destroyed and replaced by blood clot.

TABLE I—CONT'D

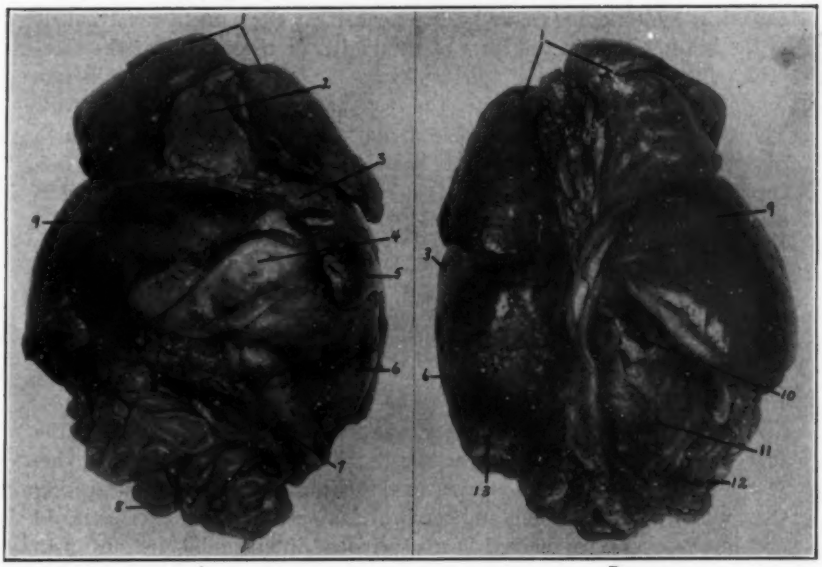
Sequelae of Suprarenal Hemorrhage

CASE NO.	AGE ON ADMISSION	CLINICAL COURSE	CLINICAL DIAGNOSIS	ANATOMICAL FINDINGS	MICROSCOPIC FINDINGS
42 Female	6 days	Prolonged instrumental labor, pallor, listlessness, collapse, low temperature for 24 hours. Evidence of free fluid in abdomen. Hg. 35 per cent. Transfusion. Masses felt in abdomen on both sides, in kidney region. Twitching began. Admission temperature, 95° F.; came up after transfusion. Died 36 hr. after admission.	Hemorrhage of newborn. Intraabdominal hemorrhage, cerebral hemorrhage.	Retroperitoneal hemorrhage. Bilateral massive suprarenal hemorrhage.	The cortex of both glands was present as only a thin shell surrounding blood clot. Patches of calcareous deposit immediately underneath the cortex.
43 Male	5½ yr.	Inability to walk, 3½ mo. Tremor of hands and arms, tiring easily. Began to have difficulty in talking. Recently had incontinence of urine and feces. P.E. revealed a weak child. Marked choking of the disks. Reflexes variable.	Midline cerebellar tumor.	Tumor of hypothalamus, internal hydrocephalus. Pyelitis of right kidney. Calcification of suprarenal.	Right suprarenal fibrosed. Very little gland tissue remaining. In the center of the fibrous tissue were calcareous deposits and bone formation with marrow spaces. Adjacent to this there was phagocytosis of hemosiderin.



A. *B.* *C.*

Fig. 1.—Photographs of massive suprarenal hemorrhage. *A* and *C* (Cases 2 and 42, respectively) were from the newborn group. *B* (Case 29) shows the result of a burn. Note the large size of hemorrhage in *A* (Case 2).



A. *B.*

Fig. 2.—Case 41. Photographs showing all the viscera and the relation of hematomas, the large one on the left and smaller one on the right. *A*, Anterior view; *B*. Posterior view; *1*, Lungs; *2*, heart; *3*, diaphragm; *4*, stomach; *5*, spleen; *6*, mass; *7*. transverse colon; *8*, small bowel; *9*, liver; *10*, right suprarenal blood clot; *11*, right kidney; *12*, small bowel; *13* perirenal fat.

Suprarenal hemorrhage was associated with definite hemorrhagic disease of the newborn in one case only (Case 1). Intracranial hemorrhage was present in five cases, indicating that the delivery was probably difficult. Sepsis or bronchopneumonia occurred in five and may have been a factor in the production of the hemorrhage.

OLDER AGE GROUP

Infection.—In the group of the older infants and children with infection as the probable cause of the hemorrhage in the suprarenal, there was only one (Case 18) in which the infection could possibly be excluded as the cause of the symptoms. In this patient the onset was twenty-four hours before admission with vomiting. Diarrhea followed with rapid respirations and high fever; the child was moribund on admission. A blotchy rash and petechial hemorrhages were noted. The pathologic findings were negative except for the hemorrhage. There was no discoverable infection in this patient, although the fever of 105° F. made it seem probable. It is possible that this may have been a fulminating cerebrospinal meningitis.

Five of the fifteen patients had lesions in the kidney, such as pyelonephritis, hydronephrosis, and acute nephritis. Six showed involvement of the brain, either in the form of meningitis or thrombosis of the cerebral veins. Septicemia was present in seven. Bronchopneumonia was found in seven, of which three were associated with generalized sepsis. The hemorrhage in six of the fifteen patients was extensive enough to disorganize the gland somewhat, but in the majority consisted of diffuse extravasation of blood. Organized blood clot with phagocytosis was present in one case.

Burns.—In the four patients with suprarenal hemorrhage resulting from severe burns, the symptoms were those of collapse and circulatory failure. This may be due to the toxemia from the burn, or possibly the suprarenal hemorrhage may have produced these symptoms. Two had associated duodenal ulcers. Microscopically, the affected suprarenal glands were found practically destroyed by the hemorrhage (Fig. 1).

Miscellaneous Causes.—In the miscellaneous group of two cases, the first was the result of an automobile accident; death was probably due to the fractured skull. However, in the clinical course it is interesting that, in spite of the cranial and cerebral damage, the pulse became rapid and blood pressure remained low. Increased intracranial pressure usually causes the opposite effect.

The other case occurred as a result of a transfusion in which a so-called universal donor was used. The child collapsed, became blue, and died. This course may have been due to the suprarenal hemorrhage or possibly as a result of the many other changes occurring from incompatibility of the blood. Following this catastrophe, the practice of using

universal donors was discontinued in this hospital. There were no cases of suprarenal hemorrhage as a sequence to incompatibility of donors' blood in the literature at our disposal.

Sequelae.—In one patient there was fibrosis of the suprarenal gland following a former hemorrhage that was becoming organized. Calcification of the suprarenal was not diagnosed antemortem in any of the eight patients in whom it was found at autopsy (Figs. 3 and 4). In two (Cases 38 and 39), however, there were roentgenograms taken during life which

Fig. 3.—Roentgenogram of abdomen showing calcification in region of suprarenal (Case 39).

showed unusual opacities on both sides of the vertebral column (Fig. 3). These were subsequently shown to be the calcified suprarenal glands (Fig. 4). In Cases 36, 41, and 42 there was difficult delivery and history suggestive of suprarenal hemorrhage occurring at birth. In Cases 38 and 39 there was a chronic kidney disease, pyelonephritis.

In all the cases showing calcification, with the exception of Case 40, along with the calcareous deposits, there was evidence of previous hemorrhage in the form of hemosiderin contained within phagocytic cells. In

Cases 41 and 42 there is no doubt that the calcareous deposit was the result of the hemorrhage, and in five of the remaining six cases it is practically certain.

How much the change in the suprarenal gland had affected these patients, six of whom lived beyond the newborn period, is hard to say. However, in the history of each it is evident that they had not been normal children. "They have always been a feeding problem," "listless," etc.

DISCUSSION

The suprarenal glands develop in two parts.[33, 34] The cortex comes from the celomic epithelium over the mesonephros and includes part of the mesonephric tubules. The medulla arises from part of the neural ridge which goes to form the sympathetic nervous system. The cortex

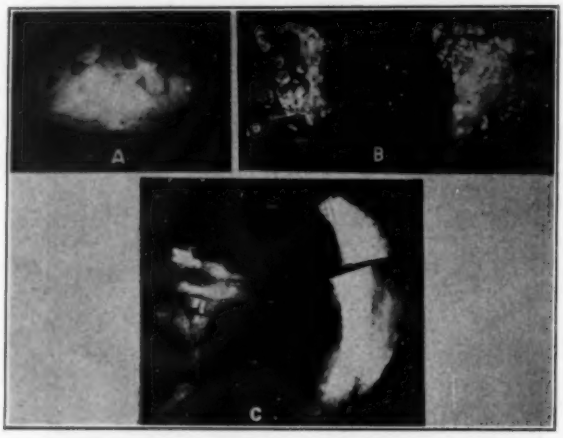


Fig. 4.—Roentgenograms of calcification in suprarenal, taken after removal at postmortem: *A*, Case 38; *B*, Case 39; *C*, Case 43.

is yellowish in color, and the medulla, reddish brown. The glands are situated on the upper pole of either kidney. Accessory suprarenal glands are frequently found in the broad ligament of the female or the epididymis of the male. They are endocrine glands which are necessary for life.[35] The animal can live without the medulla, but the cortex is indispensable. Both parts are capable of regeneration. The suprarenal gland is the most vascular organ of the body in that it receives the greatest relative amount of blood for its weight every minute. The blood supply comes from branches of the inferior phrenic, aorta, and renal arteries.

In the newborn the medulla is relatively small, and the cortex is quite large and loose. In the first two weeks of life the central portion of the cortex becomes quite vascular, and the medulla grows at the expense of this portion.

In our series agreeing with others, hemorrhage of the suprarenal gland in the newborn is usually found during the first week of life. This is during the period of hemorrhagic disease of the newborn which may be an etiologic factor. The other factors to be kept in mind during this period are damage during labor and the increased vascularity occurring in the neonatal period.

During the later period in which infection is a factor, most writers indicate that a blood stream infection is present. Attention has not hitherto been drawn to the nearby involvement of the kidney with pyleonephritis, which probably spreads to the suprarenal gland by direct extension or by way of the veins in thrombophlebitis. (This was present in Cases 23 and 38.) Chronic kidney disease was present in five

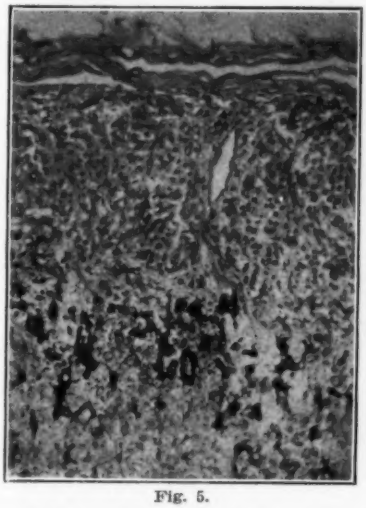


Fig. 5.

Fig. 6.

Fig. 5.—Case 41. Patient ten days old. Calcification has already taken place immediately underneath the cortex, adjacent to the hemorrhage. A similar picture was seen in Case 42 (patient 8 days old). H. & E. ×120.

Fig. 6.—Case 38. Patient 9½ mo. old. In lower part of field can be seen organized blood clot, while above this are deposits of calcium, H. & E. ×120.

with hemorrhage alone and in three with calcification, or 31 per cent of the patients beyond the newborn period.

Fifty per cent of the infection group had septicemia. Many of these had involvement of meninges as well. Three of these were fulminating cases of meningococcus septicemia, and Case 18 may have been. In a few, bronchopneumonia and upper respiratory infection were all that could be found.

Calcification of the suprarenal is usually thought of as a late event in Addison's disease or tuberculosis of the suprarenal gland. However, it was described by Marine[28] in cats suffering from distemper, and

reference to the possibility of its occurring as a result of suprarenal hemorrhage in the newborn was made by Adami and Nicolls[30] and Mallory.[25] Again some state that it may be the result of necrosis of the gland. In this series it definitely followed previous hemorrhage.

When one recalls the ease with which calcium salts are deposited elsewhere in the body, their deposition in old adrenal hemorrhages is not surprising. One common type for such calcareous change is in old thrombi. The constituents of a thrombus and a localized hemorrhage are quite similar. Both may undergo organization and frequently show phagocytosis of blood pigment and occasionally calcification. As a matter of fact, Case 39 showed, in addition to the adrenal lesion, a recent thrombus in the inferior vena cava with calcareous degeneration. This,

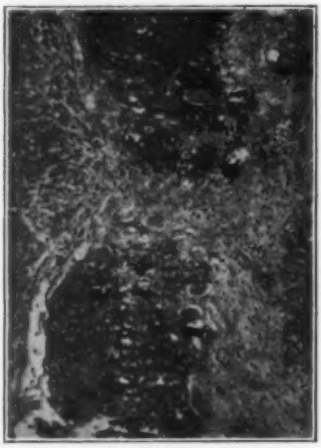


Fig. 7.

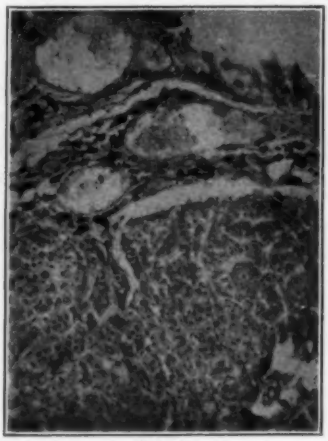


Fig. 8.

Fig. 7.—Case 37. Patient 4¾ mo. old. A small amount of cortex can be seen on either side of the medulla which is almost entirely replaced by calcium. H. &. E ×100.

Fig. 8.—Case 37. Patient 4¾ mo. old. Phagocytic cells in medulla, packed with hemosiderin. H. & E. ×140.

however, had obviously developed much more recently than that in the adrenals.

The time required for calcium to be deposited is also a matter of interest. The youngest patient in the series showing calcification was only eight days old (Case 42). In this instance the hemorrhage into and around the right suprarenal was very extensive while less marked hemorrhage had occurred in the left gland. However, at this early date, calcareous deposits could already be seen lying just at the edge of the blood clot immediately underneath the remains of the thinned-out cortex. Similar calcareous deposits also immediately underneath the cortex were found in Case 41. This infant died at the age of ten days.

That this degree of calcification can take place in the short space of eight to ten days is not at all surprising in the light of what is known regarding the calcification of a callus surrounding a fracture. Here, also, the calcification is preceded by hemorrhage, and while such calcification in the adult may not be recognized roentgenologically for a matter of nearly four weeks, in children it may take place as early as the end of one week,[36] and, according to Rolph,[37] the younger the infant, the more rapidly calcification occurs. Case 41 is also of interest because of the extensive calcareous deposits in the tubules of the cortex of both kidneys (Fig. 5). These deposits, however, are on the whole more dense and tend to be concentrically arranged within the tubules, the epithelial cells of which seem to have disappeared. Whether they are in any way

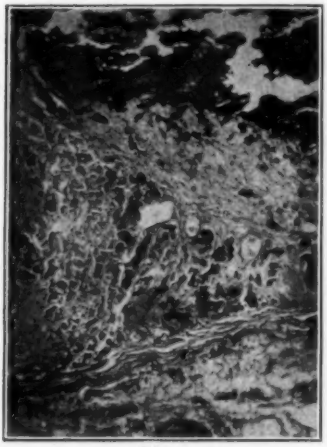


Fig. 9.

Fig. 10.

Fig. 9.—Case 40. Patient 17 mo. old. Here the calcareous material in the medulla approaches the capsule of the gland. A segment of the cortex is also almost completely destroyed. H & E. ×120.

Fig. 10.—Case 39. Patient 7 mo. old. Extensive replacement of both cortex and medulla with calcareous material, showing bony metaplasia in the center of the field. A similar picture was seen in Case 43. H & E. ×36.

related to the suprarenal hemorrhage, or whether they are even entirely of postnatal development is a matter of speculation.

Other evidences of changes taking place in the clot are also seen at an early date. In a nine-day-old infant (Case 11) with fairly marked bilateral suprarenal hemorrhage, while no calcification was seen in either gland, there was already considerable fibroblastic proliferation in the periphery of the clot where it lay in contact with the thin layer of cortical cells immediately underneath the capsule. Many of the red cells by this time had also undergone varying degrees of disintegration, in some places forming a more or less homogeneous pink-staining mass. Phagocytosis of blood pigment was not noticed in any of the cases as early as this.

In those children surviving for several months, evidence of hemorrhage could still be seen in the marked irregularity of the structure of the gland and by the presence of fibrosis, phagocytosis or iron-containing pigment, and by irregular deposits of calcium (Fig. 6—9½ mo.; Figs. 7 and 8—4¾ mo.; Fig. 9—17 mo.). In Cases 39 and 43, in addition to the calcification, there was also bony metaplasia with formation of marrow spaces (Fig. 10). Such metaplasia has long been recognized as occurring in the sclerotic walls of blood vessels in degenerated tumors, as for example, in the uterus and the thyroid; and we have seen one such instance in a case of an ependymoma of the brain in a child. In these instances it must be assumed that some of the connective tissue cells in the region of the calcareous deposits become specialized as osteoblasts, thus giving rise in the process of time to true bone.

Total loss of the suprarenal is incompatible with life. From this series it is evident that there is partial damage to the gland which is not fatal at the time. This is quite evident from the patients with calcification as the hemorrhage must have occurred some time previously. Some of these were not in good health previous to the final illness. It is possible that partial damage may modify the life and metabolism of the individual; this possibility is interesting.

SUMMARY

The records of forty-three cases of suprarenal hemorrhage observed at postmorten have been discussed. Only one case was diagnosed clinically.

Fifteen of these were in newborn infants. The symptoms noted in this group were of two types: on the one hand, collapse; on the other, stimulation.

In the older age group fifteen cases of suprarenal hemorrhage were found associated with infection. Chronic renal disease, septicemia, and meningitis were the most frequently associated infections.

Four patients with burns, one following a severe accident, and one a transfusion from an incompatible donor made up the miscellaneous group.

In seven cases in which death was due to intercurrent disease, calcification was found in six cases and fibrosis in one. In two patients in the newborn period with fatal massive hemorrhage of the suprarenal, beginning calcification was found microscopically. In eight of the newborns there was definite evidence of previous hemorrhage into the gland. Some of these patients had shown, prior to the final illness, a tendency to be less robust than normal infants of the same age.

A résumé of the available literature is given.

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CHOREA: IS IT A MANIFESTATION OF RHEUMATIC FEVER?

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SEVEN years ago we began a study of chorea and its relation to rheumatic infection in childhood. Provisions were made for the study by grouping all hospital and dispensary patients with chorea into a special clinic. Up to date approximately 150 patients have been registered, a number presenting an unusual opportunity for study. Originally we had no doubt as to the rheumatic origin of chorea, but as the study progressed we have come to question the absolute accuracy of this orthodox concept.

PLAN OF STUDY

Four methods of approach were employed:

1. A careful detailed social service survey of fifty-eight of these patients.†

2. A review of all their hospital and clinical records.

3. A comparison with a control group‡ One of us spent six weeks in a camp especially designed to provide convalescent care for children, aged from seven to fifteen years, suffering with rheumatic heart disease. This group, offering a somewhat similar social background to our chorea group, was used as a control to determine the frequency of a history of chorea in rheumatic endocarditis.

4. A final physical reexamination of forty-five patients with special reference to cardiac findings, including fluoroscopy and electrocardiography. In these forty-five both hospital and clinic records were especially satisfactory. This group was chosen to give a cross-section of the larger material.

LITERATURE

It is not our purpose to review in detail the voluminous literature but simply to call attention to the trends since we started our investi-

From the Sarah Morris Hospital for Children and the children's cardiac service of the Mandel Clinic of Michael Reese Hospital, aided by the Emil and Fanny Wedeles Fund for the Study of Diseases of the Heart and Circulation.

Read in abstract before a joint meeting of the American Academy of Pediatrics and the Central States Pediatric Society, Sept. 22, 1933.

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†We are greatly indebted to Miss Ruth Emerson, Associate Professor of Medical Social Work in the School of Social Service Administration of the University of Chicago; Miss Elizabeth McConnell, Executive Director of Mandel Clinic; Miss Aletta Horn, Head of the Department of Social Service at the Michael Reese Hospital; Miss Elizabeth Condon and Mrs. Helen Salzman for the assistance offered in the survey.

‡We wish to express our thanks to the Sunset Camp Service League for access to their records.

gations. In 1927 one of us[1] noted that tonsillectomy had no appreciable effect upon the course of chorea and tentatively raised the question as to whether all chorea was rheumatic in origin. The same year Kaiser[2] also noted that tonsillectomy had no effect upon the course of chorea but that the tonsillectomized patients were less likely to develop endocarditis. These conclusions were corroborated in his later studies.[3] Apparently Kaiser accepted chorea as a manifestation of a rheumatic infection. Working independently we[4] arrived at conclusions similar to Kaiser's but reiterated our question as to the rheumatic origin of all instances of chorea.

These studies have had little effect upon the subsequent literature. The majority of observers still accept chorea as a manifestation of a rheumatic infection or, at any rate, of a chronic streptococcus infection. For example, only recently Lueth and Sutton[5] have reported cases of chorea occurring in the negro, which they apparently accept as a rheumatic manifestation. Occasionally authors have attempted to relate chorea to other origins, such as encephalitis,[6] metabolic or constitutional factors,[7] or derangements of the thyroid, parathyroid, or adrenal glands.[8] The effect of emotion has long been known and recently has been reemphasized by Sturton[9] and Berg.[10] In only one instance has the disease been studied as a behavior problem,[11] an approach we have found exceedingly beneficial in our plan of therapy.

Some recent experimental work has suggested differences between active rheumatic infection and chorea. Hassler and Moller[12] report the sedimentation of red cells normal in chorea but definitely changed in active rheumatic infection. This has been corroborated in a recent paper by Elghammer.[13]

RESULTS

As a result of our own investigations our conception of the true nature of chorea has been altered. It now seems to us that chorea is a clinical syndrome rather than a disease entity, developing in a child, predisposed to it by heredity and constitution, upon exposure to exhausting psychic stimulation or various infectious factors. While some of the patients have suffered from rheumatic infection, the intimate relation of the rheumatic "virus" to the active etiology of chorea is by no means clear. Indeed, psychic trauma seems a far more important factor in its etiology than does any type of infection.

From the standpoint of etiology, the results of our statistical and clinical investigations are presented in composite in two groups, predisposing and active causes of the disease.

A. Predisposing Causes

Heredity.—Heart disease was reported in thirteen families but was mostly of the degenerative rather than the rheumatic type. These families gave no special history of rheumatic fever. A history of

chorea was obtained in fourteen families and of epilepsy and psychoneuroses in eight others. There were fourteen individuals in the families with thyroid disease. Every family with the exception of three was reported as poorly integrated from the social point of view with exaggerated emotional reactions.

Age.—The onset of chorea occurred between the ages of five and thirteen years, most commonly between the ages of seven and twelve. No case of chorea occurred after puberty. All of the 150 cases recovered at or before this period, and there were no recurrences. In other words, something connected with the endocrine hormones seems to play a rôle—if not active, at any rate decidedly predisposing.

Sex.—Twenty-nine patients were girls, and sixteen were boys.

Living Conditions.—It is known that chorea like rheumatic fever occurs more frequently in the clinic than in wealthier private practice. In our series the wretchedness of living conditions seemed worse than in the usual clinic family. In one instance ten adults occupied four rooms. In twelve families, three or more persons occupied each room, and in thirty families the child shared his bed with another child or adult. The afflicted child was usually found sleeping in the dining room or kitchen, disturbed by the adults and kept awake by the lights, confusion, and blare of radios in adjacent tenements. Associated with poverty invariably is the question of food. While we have not quantitated the diets, it would appear that the diets were generally inadequate, especially as regards vegetables and fruits.

Temperament.—It is known that chorea occurs chiefly in the intelligent overstimulated child. Thirty-eight of our forty-five children showed more than average intelligence in school. Five were definitely subnormal.* Chorea seems to occur most frequently in the child of a certain type—the one with introvertive tendencies. Practically all our children were found to be worrying about poverty and family problems, and all but three were considered poorly adjusted to the

TABLE I

SIZE OF FAMILY (58 PATIENTS)

NUMBER OF CHILDREN IN FAMILY	NUMBER OF PATIENTS
1	4
2	10
3	14
4	11
5	8
6	4
7	4
8	2
9	--
10	--
11	--
12	1

*These represent all the subnormal of the entire 150. Their records were included in the forty-five because they had all been hospitalized.

conditions at home or school. Twenty-nine presented some definite behavior problem, severe enough to attract the attention of the schoolteacher. Of course, this may have been associated with the onset of the disease, but if so, the onset is of a nature far more chronic and unusual than that of any common infection. In short, children with chorea seem to have a certain predisposing constitution which we have come to consider "the chorea temperament."

TABLE II

NUMERICAL STATUS IN FAMILY (58 PATIENTS)

ORDER OF BIRTH	PATIENTS
1st	20
2nd	13
3rd	10
4th	6
5th	3
6th	3
7th	1
8th	1
9th	--
10th	--
11th	--
12th	1

Regrouping Tables I and II as to oldest, youngest, and only child shows:

First born	20
Youngest	15
Only	6

Forty-one of fifty-eight children who developed chorea occupied positions in the family known to pediatricians and students of behavior as being hazardous.

B. Active Causes

We found nothing in the survey of the records, the searching social or medical investigations, or the final physical examination to suggest a close etiologic relationship of rheumatic fever or any specific infection to chorea. This is based on the following observations:

Onset.—The onset is usually insidious, the child being nervous, irritable, and abnormal for weeks or months before the acute manifestations—very different from the history of ordinary infection. Sixty-five per cent of our cases gave a history of symptoms long before the onset of the chorea, and in only three did the chorea start acutely in an apparently stable individual.

Relation to Infection.—Four children had suffered from scarlet fever and one from diphtheria. Six had definite clear-cut articular rheumatism. Ten histories of vague aches and pains suggested rheumatic diathesis. In none did the chorea immediately follow the infection.

Clinical Course.—There is nothing in the clinical course, temperature, pulse, or blood count to suggest acute infection.

Cardiac Involvement.—Thirteen children showed no cardiac findings at any time. In thirty-two there were some abnormal cardiac findings present at or during their period of hospitalization. Of these thirty-two, nineteen occurred in children with chorea but with no history of acute rheumatic fever. In these nineteen, the murmurs were transient and disappeared before the child left the hospital, very different from true rheumatic endocarditis. Of the thirteen in whom a murmur was present upon discharge from the hospital, nine showed some cardiac enlargement, but these findings had been present upon admission and the child had previously suffered from definite rheumatic infection. Most of these had tonsils. This will be discussed again later.

Psychic Factors.—While our search offered no confirmation of the rheumatic etiology of chorea it did emphasize strikingly the importance of emotional factors in our clinical material. Psychic trauma seemed so intimately related to the actual onset in twenty-two cases as to force the question of its being the activating factor. Domestic discord was a prominent feature. It was plainly apparent in thirty-two families and extreme in thirteen. The onset of acute manifestations often followed a domestic crisis, such as divorce, separation, desertion, drunkenness, and the advent of stepbrothers and stepsisters. Other types of emotional injury were common. In three girls the onset was related to attempted rape. In four others the child lived in continuous dread of assault by undesirable characters in the neighborhood. One child was aware of the illicit sexual relations of her mother. In others the onset followed acute fright. In short, in our series psychic trauma resulting from fright or overwhelming grief stood out far more strikingly than did any history of infection.

Relation of Rheumatic Fever and Tonsils to Endocarditis.—The final physical examination of our forty-five children showed a surprisingly low incidence of endocarditis compared to what we had expected to find. It also revealed an interesting relationship of this endocarditis to rheumatic fever and to the presence of tonsils as shown in Table III. Our findings confirm the previous observations that tonsillectomy has no effect upon the course, severity, duration, or tendency toward recurrence of chorea. Tonsillectomy does have a definite influence upon the development of endocarditis in patients who subsequently develop chorea.

The incidence of endocarditis in those choreic patients who still had tonsils and who gave a history of rheumatic arthritis is shown in the column on the left in Table III. It will be seen that practically all these patients developed endocarditis. In the middle columns are those patients with a questionable history of rheumatism, such as the

usual vague muscle aches and pains. In this group endocarditis occurred chiefly among those choreic patients who still retained their tonsils. On the right are the choreic patients with no history of rheumatic fever. Endocarditis again developed practically exclusively in those still retaining their tonsils. The absence of endocarditis in the large group of choreic patients with previous tonsillectomy and with no history of rheumatic fever is striking. Table III suggests definitely that in chorea endocarditis develops not as a result of the chorea but from a more or less independent tonsillar and rheumatic infection.

TABLE III

ENDOCARDITIS DEVELOPED IN OUR CHOREA CASES AS FOLLOWS

HISTORY OF RHEUMATISM AND TONSILS PRESENT WHEN SEEN	NO HISTORY OF RHEUMATISM, NO TONSILS	QUESTIONABLE HISTORY OF RHEUMATISM, TONSILS PRESENT	QUESTIONABLE HISTORY OF RHEUMATISM, NO TONSILS	NO HISTORY OF RHEUMATISM, TONSILS PRESENT	NO HISTORY OF RHEUMATISM, NO TONSILS
++0	No cases	0++	000	0+	00
+ (youngest of 12)		+(?) 00	0+(?)	0+(?)	00
+ (scarlet)		++0		000	00
+				00+(?)	00
				+	0+
					00
					00

CONTROL STUDY

An effort was made to compare the home conditions of this group with that of another group of clinic patients attending a special cardiac camp. In our group we had endeavored to determine how frequently chorea led to endocarditis. In the control group, all of whom had endocarditis, we endeavored to determine how frequently a history of a preceding chorea could be elicited.

The social surveys were made by different workers and from different viewpoints; hence, we do not feel the comparison above criticism, but there is certainly not the same history of marked poverty and domestic infelicity in the group of cardiacs. The medical histories of these control cardiac children are striking. Apparently uncomplicated chorea was only occasionally associated with the development of endocarditis. Of fifty-five boys, forty-one gave a history of rheumatic fever alone. Thirteen had rheumatic fever and chorea. Only one had chorea alone, and here the cardiac lesion was doubtful. The girls were particularly interesting. Of ninety-four, sixty-eight gave a history of rheumatic fever alone, eighteen of rheumatic fever associated with chorea and eight of chorea alone. In four of the latter the cardiac lesion was doubtful. The incidence of chorea is twice as great in girls as in boys. Hence one would expect to find a history of

chorea more frequently in cardiac girls than boys. In this series chorea appeared in approximately the same percentage in either sex, and endocarditis only rarely followed uncomplicated chorea.

DISCUSSION

Until the infectious origin of chorea is either proved or repudiated no definite conclusions can be drawn as to etiology. To formulate our own opinions even after these seven years is still a difficult task. The clinic children with chorea come from an environment which seems to favor rheumatic infection. The two conditions do exist as concomitants and, when chorea is associated with a rheumatic infection, the subsequent endocarditis is often more severe. Furthermore, it seems to us that the constitution, diathesis, or temperament, and possibly the endocrine balance may play a predisposing rôle in *both* conditions though the introvertive tendencies seem universally present in the choreic children only. In the choreic patients, adverse social and economic conditions are an important contributing factor in producing a state of mental overstimulation. Given such a background, our histories suggest that any trauma, be it psychic or infectious, may precipitate an attack of chorea. As these children come from an environment favoring rheumatic infection and may themselves be constitutionally predisposed to rheumatic fever, it seems logical that such infection should frequently be listed in the etiology of chorea. On the other hand, observation of these children over a period of years and the finding that endocarditis is by no means an invariable complication of chorea, but almost exclusively a sequel of true rheumatic and tonsillar infection, lead us to think of rheumatic fever and chorea not as cause and effect but as concomitants in the same type of child. We feel that rheumatic infection is not a specific etiologic factor but one of the many, either psychic or infectious, which may precipitate the disease.

It is well known but perhaps insufficiently emphasized that these children never show any clinical sign of permanent organic defect of the nervous system. There is complete clinical recovery in all cases.

Can psychic trauma produce such a syndrome? The recent discussions of Schilder and Malamud[14] offer support for such an hypothesis, but further work along such lines is necessary.

We must also raise the question of whether our low incidence of endocarditis may be due to the special clinic which kept the patient under close observation. It is possible that had the children been turned loose with no preventive cardiac supervision the incidence of endocarditis might have been higher. In a previous publication[15] we have called attention to the excellent results and the few recurrences following from what we call the prophylactic treatment. By keeping the youngsters under constant observation, social and medical, and in-

terpreting the children's needs to the parents, obtaining cooperation from the school-teacher, avoiding the radio and thrilling movie, only six of the forty-five patients developed a recurrence and three of these had not been faithful attendants at the clinic. Possibly this treatment may have of itself prevented endocarditis.

SUMMARY AND CONCLUSIONS

1. One hundred fifty cases of chorea have been registered in a special clinic during the last seven years.

2. Forty-five of these, who had also been hospitalized, were selected at random for an intensive social service and medical study.

3. A clear-cut history of rheumatic fever was obtained in only six cases. Fourteen additional cases gave a questionable rheumatic history.

4. Definite endocarditis developed in twelve patients. Five of these gave a history of true arthritis. In four a questionable history was obtained. In eleven of the twelve, tonsils were present. In only one case of chorea without tonsils and without a history of a rheumatic infection did endocarditis develop.

5. The absence of endocarditis in the large group of choreic patients previously tonsillectomized and with no history of rheumatic fever strongly suggests that rheumatic fever and tonsillitis must play a far more important rôle in the etiology of endocarditis than does chorea.

6. A review of the histories of a control group of children with rheumatic endocarditis only rarely revealed a preceding history of uncomplicated chorea.

7. In our series chorea developed in mentally alert, introvertive children. These children are apparently predisposed by their particular constitution, heredity, environment and in some instances a possible endocrine imbalance. From our observations, there is little to favor a specific infectious origin of chorea. It seems to us that chorea is not a manifestation of rheumatic infection per se but that it is a clinical syndrome developing in a predisposed individual as a result of various psychic or physical insults. No matter what the exciting cause may be the choreic constitution seems of paramount importance. In our series chorea less frequently followed infection than it did psychic trauma resulting from exhausting psychic stimulation.

8. Our studies suggest:

a. Chorea may be caused by rheumatic fever, but this is only one of many immediate causes. Psychic trauma seems far more important.

b. More important, too, are predisposing causes such as age, environment, temperament, special constitution, and possible endocrine factors.

c. Chorea should not be taken as an indication of rheumatic infection without other rheumatic manifestations.

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THE OCCURRENCE OF BLOOD-FILLED CYSTS ON THE CARDIAC VALVES IN INFANCY

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ROUTINE postmortem examinations of the hearts of newborn infants and children in the pathologic laboratory at the University of Minnesota during a period of six months disclosed the rather frequent occurrence of small, blood-filled elevations on the auricular surfaces of the atrioventricular valves. In view of the fact that such findings may be misinterpreted for endocardial vegetations by one unacquainted with their anatomic significance, it seems advisable to discuss their frequency and benignity.

The presence of these cysts has received but slight attention by various investigators since Luschka described his first case in 1857. Two reports have appeared from this country. Apparently the condition has generally been recognized by those making neonatal pathologic examinations and has been considered an unimportant anatomic finding.

The present series of cases is based on postmortem examinations of seventy-two infants, most of whom had been premature, stillborn, or had died within the first week of life. A few older children were included. Of the seventy-two hearts, twenty-three, or 32 per cent, disclosed the presence of blood-filled cysts on the cardiac valves. This figure corresponds well with the incidence of 25 per cent which Luschka reported in the first description of the condition, but it fails to agree with the higher figures of 60 to 80 per cent given by other investigators.

The age factor is important. The majority of subjects, it will be noted, were full-term infants who had either been stillborn or had died within the first week of life. The oldest child of the group with cysts on the cardiac valves was eight months of age; the youngest, a premature infant in the seventh month of gestation. Although the largest number of cysts (fourteen) occurring in any of these cases was found in the case of this premature infant, none were found in a group of five hearts from fetuses six months old or less when the cardiac valves were studied microscopically in serial section. The causes of death in the entire series were principally trauma at birth, congenital malformations, or, among older children, infection.

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Work done under the direction of Dr. E. T. Bell, Department of Pathology, University of Minnesota, Minneapolis, Minn. Submitted for publication, Aug. 10, 1934.

The site of predilection for these nodules is the atrioventricular valves, with the tricuspid valves slightly the favorite. In ten cases the tricuspid valves were affected; in six, both tricuspid and mitral valves; in five, the mitral alone; and in one case each, the aortic and pulmonic valves, respectively. The presence of a blood-filled cyst also was noted on a papillary muscle in one case. These cysts usually are found from 1 to 3 mm. removed from the free edge of the valve on its auricular surface although they may occur anywhere on the surface of the leaflets. Cysts have been reported as having been present on the ventricular aspect of the atrioventricular valves, but they are infrequent. Occurrence at the line of closure has also been noted, although not in any of the present cases.

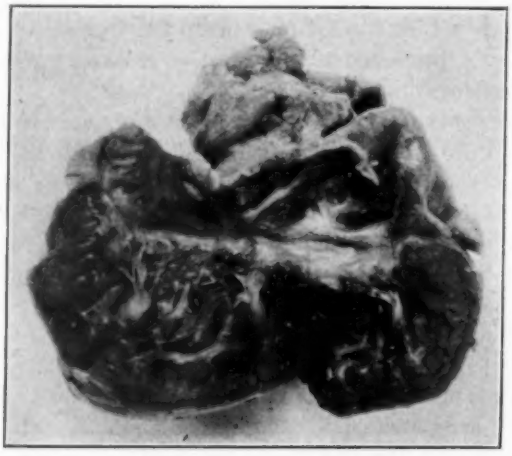

Fig. 1.—Heart of fetus in seventh month of gestation. Several blood-filled cysts are present on the auricular surface of the tricuspid valve.

It is usual for these cysts to be multiple, and, occasionally, they may be so closely grouped that the surface of the valve resembles a raspberry, which condition occurred in a case reported by Haushalter and Thiry in which there were forty cysts on a single leaflet. In the present series eleven cysts were found on the tricuspid valves in one case and, in this came case also, three on the mitral valves. Cysts on the semilunar valves project on the ventricular aspect of the valve near the base of the cusp. There were but two such cases in the series.

The cysts varied in size from that of a pinpoint to 2 mm. in diameter. The largest cyst reported was that by von Kahlden which measured 3 by 9 mm. They may be multilocular, and this is particularly apparent when they are seen microscopically. Grossly, they appear as dark, sharply circumscribed, rounded elevations on the smooth surface of the valve. They are easily visible in a good light with the naked

eye because of the contrast of the dark contents of the cyst against the pale background of the surface of the valve (Fig. 1).

Before going into the histologic nature of these small elevations on the valves, it might be well to review briefly the formation and normal structure of the cardiac valves. The atrioventricular valves of a newborn infant are small projections from the cardiac wall which are composed of fibrous tissue and are covered by endothelium. This fibrous tissue is condensed to form a sort of plate, extending from the base of the valve at its attachment to the wall of the heart and thinning out toward the free edge of the leaflet, where only embryonic cellular tissue is found. This embryonic connective tissue is the material that forms the small, nonpigmented elevations, known as Albini's nodules, on the surface of the cardiac valves of newborn infants. Some investigators claim that in late fetal life blood vessels may be demonstrated entering the

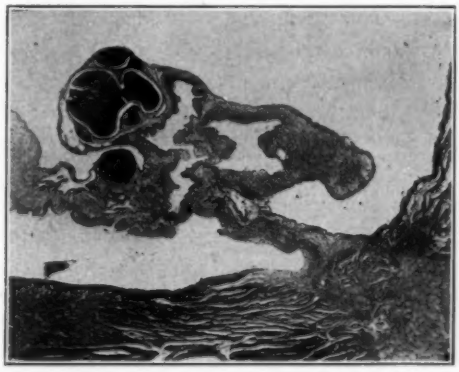

Fig. 2.—Section of the tricuspid valve of a fetus in the seventh month of gestation. The cysts are beneath the auricular endothelium and are filled with blood (×25).

cardiac valves at their points of attachment to the wall of the heart. These may possibly be remnants of the vessels that nourished the muscle fibers which are normally found in the atrioventricular valves of fetuses but which are replaced in later embryonic life by fibrous tissue. Elastic fibers are more common in the semilunar valves, but they are found in the atrioventricular valves at their points of attachment and near the auricular surface. As the child grows older, an increase of elastic tissue fibers is noted in the valves. The ventricular surface of the tricuspid and mitral valves is very uneven, owing to the insertion of the chordae tendinae, between which are many furrows and small endothelial-lined canals that penetrate into the substance of the valve toward the auricular surface in a more or less tortuous course.

These elevations on the atrioventricular valves were studied microscopically in four cases, and serial sections were made in three. The cyst

usually is a round, smooth-walled cavity, pushing up the endothelium of the surface of the valve beneath which it lies (Fig. 2). The wall is composed of a few concentric layers of fibrous connective tissue, and the lining of the cyst is made up of a single layer of spindle-shaped cells with long, oval nuclei that cannot be distinguished from endothelium. No muscle or elastic fibers can be seen in the capsule of the cyst. The cysts may be multilocular or a series of communicating cavities. If the pressure within them becomes too great, the partitions may rupture, thereby converting a group of cysts into one large cavity. The endothelial lining may slough off into the contents of the cyst.

It is not uncommon to see small out-pouchings from the periphery of the wall of the cyst, generally on the ventricular side. In addition, several small, oval or elongated spaces are seen, which apparently are lined with endothelium, lying within the substance of the valve and running in a direction at right angles to the long axis of the leaflet

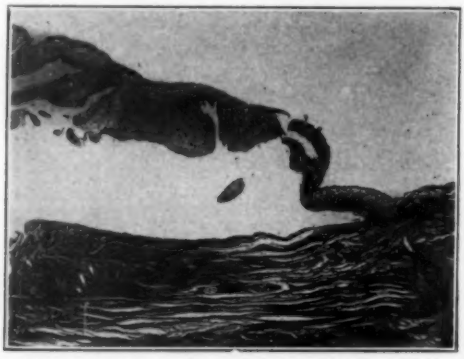

Fig. 3.—Endothelial-lined canals, in the substance of the tricuspid valve, which open into the ventricular surface of the valve (×25).

(Fig. 3). There are also many infoldings from the ventricular surface of the valve, lined by endothelium and directed toward the auricular surface. These may be very tortuous in their course and never can be traced as far as the auricular surface. They did not join cysts in any of the cases in this series.

The contents of the cysts are chiefly erythrocytes, with occasional leucocytes and cells desquamated from the inner wall of the cavity. According to Wegelin, this material becomes hyalinized as regression of the cysts occurs in later infancy, until, finally, all that remains to mark the former site of a blood-filled cyst is a little yellow pigment which is composed of iron from the erythrocytes in the substance of the valve. In the process of involution, the wall of the cyst collapses, most of the blood is absorbed, and the walls of the endothelial-lined canals, originating from the ventricular surface of the valve, approximate until they merge with the valve substance.

Four explanations have been offered for the origin of these cysts:

1. They were considered to be hematomas, first by Elsasser, in 1845, and later by Luschka, who thought them to be extravasations of blood into the noduli Albini of the valves. Trauma was supposed to play an important part in the production of these extravasations beneath the surfaces of the valves.

2. Berti, who first demonstrated the endothelial lining of these cysts, held that they are remnants of fetal valve vessels which had undergone cystic dilatation. Fahr and other investigators upheld this view, which received support from the fact that the greatest incidence of the cysts occurred on the atrioventricular valves since they were shown to be more vascular in fetal life than the semilunar valves. Also, the greatest incidence of the cysts corresponded in time with the period during which blood vessels were most prominent in the valves, the period of late fetal life.

3. Nichols, who published the first report of this condition in this country in 1908, said that they are angiomas. He found a somewhat similar condition in the bladder of the same patient, a child eighteen days old, and he compared these findings to the more common angiomas in the skin of newborn infants.

4. Haushalter and Thiry advanced the theory that they are cystic dilatations, on the ends of endothelial-lined canals, whose origin is between the insertions of the chordae tendinae on the ventricular surface of the atrioventricular valves or, in the case of the semilunar valves, prolongations into the leaflets from the sinuses of Valsalva. This has since been substantiated by several, more recent investigations. Ventricular systole forces blood into the canals and distends their terminations beneath the auricular endothelium, forming blood-filled cysts. Conditions favoring circulatory disturbance, such as asphyxia or cerebral hemorrhage, were thought to account for the more frequent incidence of cysts in these cases.

At present, the final theory seems to be the most suitable for the explanation of the appearance of these blood-filled cysts on cardiac valves. According to the proponents of this theory, the endothelial-lined canals run a tortuous course from the ventricular surface of the valve toward the auricular surface, in the case of the tricuspid and mitral valves. No connection of the cysts with vessels entering the valve at its base could be demonstrated by later workers, as Berti and others had previously claimed, and no connection with the general circulation was evidenced. There is no communication between the adjacent canals. The walls of these canals may be compressed so that all that is seen is a double layer of darkly staining endothelial cells. Compression of the canal is especially frequent as it enters the cyst, usually on the ventricular side. Sections in the present series did not reveal any

canal that could be traced from its origin on the ventricular aspect of the valve to a union with the cyst although several sections showed canals adjacent to the cyst that suggested the possibility of such a condition. Because of the tortuosity of the canals, it was impossible to demonstrate the connection of canal and cyst in any case. Jonsson made models of these cysts, by the Born method of wax-plate reconstruction, and he was able to demonstrate that the cysts have numerous stalklike projections which extend from the cyst and open on the ventricular surface of the atrioventricular valves.

Cysts on the semilunar valves are formed from canals which take origin in the sinuses of Valsalva, near the attachment of the valve cusps. These cysts are present on the ventricular aspect of the cusps. Since the semilunar valves contain more elastic tissue than the atrioventricular valves, the structure of the semilunar valves is firmer and does not favor the formation of cysts within its more compact substance. As the child grows older, more elastic fibers appearing in these valves offer more resistance to the entrance of blood into the endothelial canals.

With the majority of infants these cysts disappear by the third month of extrauterine life; however, Wegelin has found them present in the cardiac valves of several adult patients.

No cardiac murmurs have been reported as a result of the presence of these blood-filled cysts on valve surfaces, and there is no evidence that they favor the development of endocarditis or of valvular insufficiency in later life.

SUMMARY

Small, blood-filled cysts occur not infrequently on the leaflets of the cardiac valves in the neonatal period. The best explanation for their origin is that they are cystic dilatations at the ends of endothelial-lined canals in the substance of the valves.

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SODIUM THIOCYANATE IN PROPHYLAXIS AND TREATMENT OF BACILLARY DYSENTERY WITH SPECIAL EMPHASIS UPON THE SHIGA TYPE

A Progress Report Covering the First Two-Year Period of a Clinical Study

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BECAUSE of the prevalence of bacillary dysentery of the Shiga and other types and the associated unfavorable mortality, for a number of years physicians in the southern section of the United States have been seeking some specific treatment effective both in prophylaxis and therapeusis.

In June, 1932, one of us was privileged to observe at first hand the experimental work being done by Prof. A. C. Ivy, of the department of physiology, Northwestern University. I will quote from his article more recently published: "During the course of a study by Reid, Anderson, Stubblefield, and Ivy[1] on the effect of filtrates of the Shiga bacillus on the motility of the gastrointestinal tract of dogs, and during the course of a study by Crandall and Anderson on the use of sodium thiocyanate to determine 'free water' in the body, it was discovered that dogs which had received the thiocyanate four to five weeks previously failed to react in the usual manner after receiving lethal doses of the toxic filtrate. It was decided to investigate this accidental observation."

As a result of this observation, Professor Ivy and his coworkers conducted an experiment involving some five hundred dogs and a series of rabbits, with the following conclusions which formed the basis for our experiments on the human: "The intravenous (20 mg. per kilogram) or oral (60 mg. per kilogram) administration of sodium thiocyanate from fourteen days to several (four or five) weeks prior to the administration of a Shiga dysentery toxic filtrate affords protection against the lethal action of the toxic filtrate in some but not all dogs, and sodium thiocyanate (rhodanate) in this dosage is not dangerous for either intravenous use or by mouth."

Ivy suggested that from his experiments he believed sodium thiocyanate might not only prove to be effective in preventing Shiga dysentery in the human but would even possess therapeutic value as well if administered early enough after infection. After the onset of the disease, and particularly in the stage of collapse or after ex-

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tensive, bloody diarrhea, Ivy considered that the drug would probably be relatively impotent and should be used only in connection with such supportive measures as parenteral administration of sodium chloride and glucose solutions and blood transfusions.

The prophylactic dose of sodium thiocyanate recommended for trial by Ivy was 20 mg. per kilogram (1/3 grain for each 2.2 pounds) of body weight, daily, administered in broken doses for three days. His experience indicated that this prophylactic treatment should afford protection for at least one month against an otherwise lethal dose of dysentery toxin. His data did not cover a longer period or the possibility that repeated infection might diminish or overcome the protection conferred by a single prophylactic course. After the onset of the disease, a single intravenous injection of 10 or 20 mg. per kilogram of body weight of a 1.5 or 2.0 per cent solution of pure sodium thiocyanate was recommended.

Before beginning our experiments upon the human, we reviewed as fully as possible the essential pharmacology of the drug and the dosage. Sodium thiocyanate (rhodanate) has been used for a great number of conditions in the past. It has been advocated in the treatment of hypertension by many observers. Numerous reports, both favorable and unfavorable, have appeared in the last few years regarding its use in various psychiatric conditions. Numerous claims of toxicity also have appeared, but the drug in these cases was given in rather large doses and over a long period of time.

Goldring and Chassis[2] have reported toxic manifestations in thirteen patients with essential hypertension. The duration of the medication was from 7 to 69 days. The average daily dosage was 0.17 to 1.62 grams. The total dosage at the time of thiocyanate intoxication varied from 5.87 to 32.54 grams.

Egloff and his coworkers[3] reported unfavorable results with thiocyanates in the treatment of hypertension; all of the patients showed some toxic manifestation usually at the end of from two to five days. Nausea was the most prominent symptom. Ten of the twenty-five patients complained of abdominal discomfort and diarrhea. One-gram daily doses were given for one week with smaller doses for two weeks longer. However, Black and his coworkers[4] used as high as 45 grains daily over a long period of time on psychiatric patients with no toxic effects.

Pauli,[5] in a limited number of cases, found that sodium thiocyanate affected neuroses and arteriosclerosis. His tests were suggested because thiocyanate influences the aggregation of colloids in much the same way as the iodide ion, having a somewhat more solvent action. It also hastens the elimination of metals, perhaps by rendering metallic protein compounds more soluble. It resembles the iodides also in producing coryza, acne, and other symptoms of iodism.

On the basis of the work of LeRoy[6] who showed that the salt renders soluble the insoluble salts of calcium and magnesium, thiocyanates have been used in the treatment of urinary calculi. Thiocyanate has also been used in chronic nephritis, migraine, as an antispasmodic for coughs, and in recent years has been recommended in the painful crises of sickle-cell anemia.

Following Ivy's recommendations we have in no instance given more than 20 mg. per kilogram intravenously or more than 60 mg. per kilogram orally in our study; nor have we exceeded in any instance 1 gram per dose intravenously. In none of our cases have we had any toxic manifestations.

In order to assure us of the pure salt, the Abbott Chemical Company, under the direction of Professor Ivy, prepared for us ampules of a 2 per cent solution. The first consignment contained 0.5 grains per ampule; later consignments contained 1 gram per ampule. We had no difficulty in obtaining the salt sufficiently pure for use by mouth.

In order to understand the purpose and scope of our clinical observations, we feel that it is necessary to review briefly the etiology and symptomatology of bacillary dysentery as seen in the southern states.

According to Duval,[7] the term "bacillary dysentery" implies the infection of the bowel with the specific bacillus which was discovered in 1898 by Shiga, who isolated and proved its casual relationship to the disease by positive agglutination reactions with the blood of the patients. Duval states, and it has been our clinical experience, that bacillary dysentery is not caused solely by the bacillus originally isolated by Shiga but by a number of bacilli which, though racially different, belong to one and the same bacterial species. While all members of the group are pathogenic and cause what is known clinically as bacillary dysentery, the Shiga strain is regarded as the exciting cause of the more severe clinical form of the infection. On the other hand, the sporadic type of the disease is commonly caused by some of the other bacilli of the group.

Bacillary dysentery may manifest itself as an acute, subacute, or chronic infection of the lower bowel, characterized by fever, leucocytosis, and diarrhea. It affects all ages, but particularly the very old and the very young. It is most often seen as we approach the tropics.

Duval concludes that bacillary dysentery is of greatest severity in cities, where it more commonly occurs. This has not been our experience. Our epidemics have been seen in the country districts where there is no sanitation; where there is the cesspool type of toilet and unscreened houses; where the water supply is bad, dependence being placed mostly on cisterns and wells. Duval believes that the disease occurs coincident with or follows other infections of the intestines,

especially amebiasis, and that while in some patients the infection is slight, the digestive disturbance is severe. The intestinal and digestive conditions bear a general, but by no means a constant, relation to each other. While the bacilli usually disappear from the stools in two or three weeks after an attack, they may persist in the mucosa of the bowel for a much longer period. This fact explains relapses which occur months after the primary attack. Duval reports that the chronic cases give a history of exacerbations of the intestinal process which has remained without symptoms during the interval. He claims that if there are any reinfections, they are exceedingly rare.

The excitant of bacillary dysentery is spread through the dejecta, included in the so-called water-borne diseases. It is distributed by food and flies. The true carrier may have bacilli in the intestines for months.

The pathology in bacillary dysentery is essentially an acute inflammatory process of the large intestine which is characterized by mucosal ulcerations and necrosis. It is most frequently limited to the large gut, but occasionally there is inflammation in the lower part of the small intestine. Pathologic lesions have been observed as far up as the pylorus. In the severe type early characteristic pathology is focal necrosis of the solitary follicles of the large bowel mucosa. Capillaries in the necrotic area become thrombosed, and the thrombi extend down to the exit of the vessels from the submucosa. Hemorrhages are due to the unplugging of the thrombosed capillaries in the floor of the ulcers. Perforation of the bowel is almost unknown in this disease. Bacillary dysentery does not give rise to septicemia.

The symptoms are usually a severe onset, sometimes convulsions, abdominal pains, listlessness, nausea, and vomiting. There are frequent stools at first, soon becoming bloody. There is usually a high, septic type of temperature.

The Shiga type is characterized even in the mild cases by from fifteen to twenty-five stools daily. The abdomen is usually tender and rigid. The effect of toxemia on the heart and pulse has been observed.

Symptoms of dehydration and fluid imbalance appear early. There is a leucocytosis which is usually quite high. The first signs of improvement are lowering of the leucocyte count and decreased number of stools. There is disappearance of blood from the stools and the appearance of fecal material. In some cases the disease becomes chronic with its succeeding symptom of inanition.

The diagnosis of dysentery is made from clinical symptoms of rapid onset and all symptoms above enumerated, particularly bloody and frequent stools. The type of dysentery is confirmed by stool examination.

The technic we employ in obtaining material for the stool examination is as follows: The patient is given an enema, preferably of strong tea. After a short time a proctoscope is passed in the bowel and one of the ulcers found; with a sterile swab bloody material is taken from this ulcer. It has been demonstrated that these swabs may be taken in this manner, put in a sterile test tube, and kept as long as twelve or twenty-four hours without impairing their ability to grow on culture media. This is mentioned because many of the cases occur away from laboratories where the material must be sent for examination.

The following technic is used for stool examination: the swab, or a loopful of feces, is placed in 10 c.c. of sterile saline. If feces is used, a loopful of this dilution is placed in a second tube of saline. Eosin-methylene blue plates are streaked with this suspension. The next morning the plates are examined, and if any small, colorless colonies are seen, these are picked and transferred either to plain agar or EMB plate. This pure culture is then placed on the five sugars, dextrose, mannite, maltose, saccharose, and lactose. Identification of the organism is made from its reaction on the sugars. A hanging drop mount is also examined for motility. In doubtful cases, agglutination tests are set up with immune serums.

TABLE I

B. DYSENTERIAE	DEXTROSE	MANNITE	MALTOSE	SACCHAROSE	LACTOSE
Shiga	plus	minus	minus	minus	minus
Flexner	plus	plus	plus	minus	minus
"Y" Hiss. Parks	plus	plus	minus	minus	minus
Strong	plus	plus	minus	plus	minus

"Plus" equals acid—no gas; "Minus" equals no acid or gas.

Treatment generally recommended is: First and of greatest importance is the maintenance of fluid and mineral balance. This is best accomplished by injection of isotonic sodium chloride solution, and sometimes glucose solution, and by blood transfusion. All of these have been resorted to in our series of cases which are seen after the disease was well developed. None was used in the series of early cases reported in Osceola, Ark. Opium is a very necessary and essential drug to give the patient some rest. Feeding is also as essential for this condition as it is for typhoid fever. All of our patients were fed with a sustaining protein diet, fairly low at first in carbohydrate which is gradually increased, and almost entirely lacking in fat which is increased as the patient improves.

The specific treatment used by us in years past and still recommended by some authors is polyvalent antidysenteric serums, which if used at all should be given early. In our experience over a period of several years, such serums have proved of little if any value. There is a special serum for the Shiga type also on the market, which we have used with little if any result. Bacteriophage has been used but

TABLE II

SEVERE CASES CLINICALLY: DYSENTERY WITH NEGATIVE STOOL CULTURES, MEMPHIS, 1932-1933

NAME AGE SEX	HOSPITAL ADMISSION DATE	NUMBER AND CHARACTER OF STOOLS PRIOR TO ADMISSION	DURATION OF ILLNESS PRIOR TO ADMISSION	NASCN—HOW GIVEN; AMOUNT GIVEN; DATES GIVEN	APPARENT EFFECT ON CHARACTER AND NUMBER OF STOOLS	APPARENT EFFECT ON TOXICITY AND COURSE OF ILLNESS; OTHER THERAPEUTIC MEASURES
L. H. 7 yr. Female	B. M. H. 7/25/33	30 to 60 daily; bloody with mucus	5 days	10 grains intravenously 7/25 and 7/26/33	None. 17 stools day of admission; gradually diminished	Gradual decrease. Temperature normal in 10 days. Parenteral fluids.
C. C. C. 5 yr. Male	M. G. H. 6/25/33	15 to 20 daily; bloody	48 hr.	7½ gr. intravenously 6/26/33	None. Gradually diminished	Temperature came down gradually. Parenteral fluids, tea enemas and paregoric.
J. M. 4 yr. Male	M. G. H. 7/31/33	8 to 9 daily; bloody with mucus	5 days	5 gr. intravenously 8/1/33 and 7½ gr. 8/3/33	None. Gradually diminished	None. Seemed to respond to parenteral fluids and blood transfusion.
B. A. 2 yr. Female	M. G. H. 7/6/33	?	?	3½ gr. intravenously 7/16/33	None	None. Ran a prolonged course. Seemed to improve following blood transfusion; parenteral fluids given.
H. O. C. 3 yr. Male	M. G. H. 6/24/33	10 to 12 daily; bloody with mucus	5 days	4 gr. intravenously 6/24/33	None	Temperature did not return to normal for 2 weeks. Parenteral fluids; blood transfusion.
C. C. 16 mo. Female	M. G. H. 6/30/33	5 to 6 daily; blood and mucus	36 hr.	1.5 gr. intravenously 7/1 and 7/2/33	None	None. Gradual decrease in toxicity. Bismuth and paregoric.
J. D., Jr. 17 mo. Male	M. G. H. 7/25/33	10 to 20 daily; blood and mucus	5 days	3.75 gr. intravenously 7/26/33	None	Child died 3 days after admission.
J. J. 7 yr. Male	M. G. H. 8/16/33	10 to 12 daily; blood and mucus	4 days	5 gr. intravenously 8/17/33	Stools normal in 1 week	Questionable. Temperature normal in 7 days. Parenteral fluids.

TABLE II—CONT'D

NAME AGE SEX	HOSPITAL ADMISSION DATE	NUMBER AND CHARACTER OF STOOLS PRIOR TO ADMISSION	DURATION OF ILLNESS PRIOR TO ADMISSION	NASCN—HOW GIVEN; AMOUNT GIVEN; DATES GIVEN	APPARENT EFFECT ON CHARACTER AND NUMBER OF STOOLS	APPARENT EFFECT ON TOXICITY AND COURSE OF ILLNESS; OTHER THERAPEUTIC MEASURES
O. D. A. 4 yr. Male	M. G. H. 6/26/33	10 to 12 daily; blood and mucus	7 days	4 gr. intravenously 7/11 and 7/12/33	None	None. Gradual improvement. Parenteral fluids; blood transfusion.
E. M. L. 2 yr. Female	M. G. H. 7/30/33	2 to 3 daily; blood and mucus	8 hr.	2 gr. intravenously 8/3 and 8/4/33	None. Rapid improvement prior to giving drug	Temperature normal at end of 5 days. Drug, however, not given until fourth day. Parenteral fluids.
W. M., Jr. 5 yr. Male	M. G. H. 7/4/33	Many—bloody with mucus	5 days	5 gr. intravenously 7/4 and 7/5/33	None. Gradual reduction	None. Temperature dropped and stools diminished 2 days after blood transfusion. Parenteral fluids.
C. L. L. 5 yr. Male	M. G. H. 6/25/33	15 to 20 daily; bloody with mucus	2 days	7½ gr. intravenously 6/26/33	None	None. Gradual improvement. Blood transfusion.
M. B. 3 yr. Female	M. G. H. 7/16/33	Frequent bloody stools with mucus	5 hr.	3.75 gr. intravenously 7/19 and 7/20/33		High fever and convulsions on admission. Removed against advice 7/20/33. No improvement up to this time.
M. C. 13 mo. Female	M. G. H. 6/24/33	10 to 12 daily; bloody with mucus	8 days	3.5 gr. intravenously 6/26/33	None	None. Prolonged course complicated by much vomiting. Parenteral fluids.
I. R. 3 yr. Female	M. G. H. 7/11/33	Frequent bloody with mucus	8 hr.	5 gr. intravenously 7/11/33	None	None. Prolonged toxic course; complicated by pyelitis. Urotropine; parenteral fluids; stimulants.

TABLE III

SEVERE CASES WITH POSITIVE SHIGA CULTURES, 1932-1933

NAME AGE SEX	HOSPITAL ADMISSION DATE	NUMBER AND CHARACTER OF STOOLS PRIOR TO ADMISSION	DURATION OF ILLNESS PRIOR TO ADMISSION	NASCN—HOW GIVEN; AMOUNT GIVEN; DATES GIVEN	APPARENT EFFECT ON CHARACTER AND NUMBER OF STOOLS	APPARENT EFFECT ON TOXICITY AND COURSE OF ILLNESS; OTHER THERAPEUTIC MEASURES
J. D. 17 mo. Male	B. M. H. 8/12/32	20 a day with blood and mucus	4 days	7 gr. intravenously 8/12 and 8/13/32	None	Patient did not respond at all to therapy and died 8/14/32.
D. M. 9 mo. Female	B. M. H. 9/26/32	10 to 15 a day; bloody with mucus	6 days	1¾ gr. intravenously 9/28; 5 c.c. 9/30/32	None	Patient died 10/5/32. Toxic course complicated by bilateral otitis media.
D. E. D. 13 mo. Male	B. M. H. 9/16/32	10 to 15 daily; bloody with mucus	2 wk.	3.5 gr. intravenously 9/16 and 9/17/32	Gradual reduction daily for 1 week	At end of a week patient developed an upper respiratory infection, complicated by pyelitis with increase in number of stools with no blood. Urotropine, sodium, and phosphate.
B. H. 3 yr. Female	M. G. H. 10/17/32	20 to 25 daily; bloody with mucus	3 days	7.5 gr. intravenously 10/17/32	None	Child died 10/19/32.
L. H. 3 yr. Male	M. G. H. 10/14/32	10 to 15 daily; blood and mucus; prolapse of rectum	7 days	7.5 gr. intravenously 10/14/32	None	Did not seem very sick for 1 week; then very toxic. Gradual recovery. Parenteral fluids.
M. E. D. 4 yr. Female	B. M. H. 8/20/33	8 to 10 daily; bloody with mucus	3 wk.	20 mg. per kilogram body weight intravenously 8/20; 8/23 and 8/24/33	None	None. Death occurred 8/25/32. Parenteral fluids. Blood transfusions.
D. M. 7 yr. Male	B. M. H. 9/9/33	15 to 20 daily; bloody with mucus	48 hr.	12 gr. intravenously 9/9; 9/10; and 9/11/33	Stools normal within 5 days	Temperature normal in 24 hours after first dose of drug. Discharged 9/18/33.
B. E. 3 yr. Male	B. M. H. 5/23/33	20 to 24 daily; bloody with mucus	3 days	20 mg. per kilogram body weight intravenously 5/23/33	None	Died 24 hours after admission. Parenteral fluids.

TABLE III—CONT'D

NAME AGE SEX	HOSPITAL ADMISSION DATE	NUMBER AND CHARACTER OF STOOLS PRIOR TO ADMISSION	DURATION OF ILLNESS PRIOR TO ADMISSION	NASCN—HOW GIVEN; AMOUNT GIVEN; DATES GIVEN	APPARENT EFFECT ON CHARACTER AND NUMBER OF STOOLS	APPARENT EFFECT ON TOXICITY AND COURSE OF ILLNESS; OTHER THERAPEUTIC MEASURES
L. H. 12 yr. Male	B. M. H. 5/28/33	25 daily; with pus, blood, and mucus	6 days	15 gr. intravenously 5/28/33	No immediate; gradual reduction in number	Toxicity decreased in 3 days. Had a concomitant pyelitis. Parenteral fluids; blood transfusion; uritone intravenously.
M. D. 2½ yr. Female	B. M. H. 7/3/33	12 to 15 daily; watery; no blood	48 hr.	7½ gr. intravenously 7/3 and 4 gr. 7/4/33	None. Gradual reduction	Concomitant pyelitis. Gradual decrease in toxicity. Parenteral fluids. Prescription for pyelitis; tea enemas.
P. Y. 2 yr. Female	B. M. H. 6/26/33	20 daily; with blood and mucus	7 days	6 gr. intravenously 6/27 and 6/28/33	None. Gradual reduction	Gradual decrease in toxicity. Parenteral fluids. Blood transfusion.
M. E. S. 8 yr. Female	M. G. H. 5/18/33	20 to 24 daily; with blood and mucus	48 hr.	15 gr. intravenously on 5/24/33	None. Frequent bloody stools over 2 months	In hospital over 2 months. Returned 8/15/33 with stricture of rectum. Parenteral fluids. Blood transfusion.
V. F. 3 yr. Female	M. G. H. 5/24/33	8 to 10 daily; blood and mucus	5 days	5 gr. intravenously 5/24/33	None	2 weeks of fluctuous fever; then rapid return to normal.
J. F. 5 yr. Male	M. G. H. 5/24/33	12 to 15 daily; with blood and mucus	6 days	7½ gr. intravenously 5/26/33 and 5/27/33	Stools decreased markedly 2 days after drug was given	Gradual decrease in toxicity.
O. S. 11 yr. Male	M. G. H. 5/24/33	Severe diarrhea with blood and mucus	24 hr.	15 gr. intravenously 5/26 and 5/27/33	None. Many bloody stools daily	5/28/33 became cyanotic and delirious and died in a few hours.
B. J. J. 19 mo. Female	M. G. H. 6/2/33	Frequent bloody stools and mucus	4 days	7½ gr. intravenously 6/4/33	None. 7 to 8 bloody stools daily for 2 weeks	Septic temperature for 2 weeks. Parenteral fluids. Two blood transfusions.

TABLE IV

SEVERE CASES WITH POSITIVE FLEXNER-STRONG CULTURES, MEMPHIS, 1932-1933

NAME AGE SEX	HOSPITAL ADMISSION DATE	NUMBER AND CHARACTER OF STOOLS PRIOR TO ADMISSION	DURATION OF ILLNESS PRIOR TO ADMISSION	NASCN—HOW GIVEN; AMOUNT GIVEN; DATES GIVEN	APPARENT EFFECT ON CHARACTER AND NUMBER OF STOOLS	APPARENT EFFECT ON TOXICITY AND COURSE OF ILLNESS; OTHER THERAPEUTIC MEASURES
W. G. 18 mo. Male	B. M. H. 9/29/32	13 to 21 a day; with blood and mucus	8 days	7 gr. intravenously; 9/29, 10/3, and 10/15	Rapid decrease	Gradual decrease in toxicity. Blood transfusion.
L. P. 2 yr. Female	B. M. H. 8/8/32	?	?	¼ gr. intravenously 8/10/32	None	Patient died 8/12/32.
P. W. 1½ yr. Female	B. M. H. 9/30/32	12 to 14 a day; with blood and mucus	5 days	7½ gr. intravenously 9/30/32; 5 gr. 10/5/32	None	Toxicity gradually lessened. Discharged at the end of 2 weeks.
M. E. W. 17 mo. Female	B. M. H. 10/13/32	15 to 20 a day; bloody with mucus	2 mo.	7½ gr. intravenously 10/13/32	None	Child died in less than 24 hours. Bronchopneumonia.
C. C. 2 yr. Male	M. G. H. 7/24/32	12 to 15 a day; bloody with mucus	3 days	5 gr. intravenously 5/24/33	None	Child had several convulsions. Temperature 106° F.; carpopedal spasm. Death within 29 hours. Treatment for tetany.
M. W. 2 yr. Female	M. G. H. 8/5/32	12 to 15 a day; bloody with mucus	9 days	7½ gr. intravenously 8/5/32		Very toxic for 11 days. Developed pyelitis. Discharged 3 weeks after admission.
O. L. K. 3 yr. Male	B. M. H. 4/22/33	25 to 30 a day; bloody	10 days	7½ gr. intravenously 4/24 and 4/25/33	No immediate	Ran a rather toxic course. Developed malaria following blood transfusion on 5/9/33. Quinine, atabrine, plasmochin, parenteral fluids.
J. W. 15 mo. Male	B. M. H. 5/26/33	25 to 30 a day; bloody with mucus	48 hr.	4 gr. intravenously 5/27/33	Immediate reduction in 24 hours	5/29/33 urine full of pus with recrudescence of diarrhea. Subsided when pyelitis cleared up. Parenteral fluids, uritone intravenously.
B. M. 2 yr. Female	M. G. H. 5/1/33	3 to 6 daily; with pus, blood, and mucus	5 days	7½ gr. intravenously 7/3, 7/7, 7/10/33	Stools never very numerous	Gradual decrease in toxicity. Could not be attributed to drug.

TABLE V

EPIDEMIC OF BACILLARY DYSENTERY IN OSCEOLA, ARK., SPRING AND SUMMER OF 1933: SUMMARY OF CASES

Clinical cases, 30; positive Shiga cultures, 24; severely toxic, 14; moderately toxic, 13; mild, 2, 1 (?); deaths, 6; mortality, 20 per cent. Comment: Five of the six patients who died did not receive the drug.

CASES	DEGREE OF TOXICITY	DATE OF ONSET	DATE GIVEN DRUG	STOOLS DIMINISHED AFTER DRUG	TOXICITY DISAPPEARED	DATE DISMISSED	CULTURE	AGE IN YR.	SEX
1	Severe	5/14/33	None given	–	–	Died 5/21/33	None	5	M
2	Severe	5/23/33	None given	–	–	Died 5/26/33	Shiga	3	M
3	Severe	5/22/33	5/22/33	3 days	5 days	6/19/33	Shiga	13	M
4	Severe	5/22/33	5/22/33	2 days	3 days	6/10/33	Shiga	7	M
5	Severe	5/22/33	5/22/33	1 day	3 days	6/10/33	Shiga	8	F
6	Severe	6/ 1/33	6/ 1/33	4 days	5 days	6/14/33	Shiga	34	F
7	Severe	6/ 3/33	6/ 8/33	–	–	Died 6/11/33	Shiga	4	M
8	Severe	6/ 9/33	6/ 9/33	24 hr.	–	6/22/33	Shiga	8	M
9	Severe	6/15/33	None given	–	–	Died	Shiga	1½	F
10	Severe	6/16/33	6/18/33	24 hr.	2 days	6/26/33	Shiga	30	M
11	Severe	6/20/33	None given	–	–	Died 6/22/33	Shiga	2	M
12	Severe	6/24/33	6/26/33	3 days	2 days	7/ 5/33	Shiga	4	M
13	Severe	6/ 3/33	None given	–	–	Died	Shiga	6	F
14	Severe	5/28/33	6/ 2/33	3 days	4 days	6/14/33	Shiga	25	M
15	Mild	6/10/33	6/10/33	24 hr.	24 hr.	6/15/33	Shiga	9	F
16	Moderate	6/12/33	6/13/33	Same day	3 days	?	Shiga	2	F
17	Moderate	5/14/33	5/15/33	24 hr.	10 days	6/ 1/33	Shiga	28	M
18	Moderate	6/23/33	6/26/33	12 hr.	1 day	7/ 4/33	Shiga	9	F
19	Moderate	6/25/33	6/26/33	12 hr.	1 day	7/ 2/33	Shiga	6	M
20	Moderate	6/28/33	6/28/33	12 hr.	1 day	7/ 2/33	Shiga	13	F
21	Moderate	6/28/33	6/28/33	12 hr.	1 day	7/28/33	Shiga	3	F
22	Moderate	7/ 7/33	7/ 7/33	12 hr.	1 day	7/10/33	Shiga	4	F
23	Moderate	7/ 9/33	7/11/33	24 hr.	1 day	7/16/33	Negative	7	M
24	Moderate	7/ 9/33	7/10/33	24 hr.	1 day	7/15/33	None	20	M
25	Moderate	7/11/33	7/11/33	2 hr.	12 hr.	7/14/33	None	28	F
26	Moderate	7/ 7/33	7/10/33	12 hr.	12 hr.	7/14/33	None	4	F
27	Mild	7/ 7/33	7/10/33	2 hr.	6 hr.	?	Typhoid	25	F
28	Moderate	7/ 6/33	7/11/33	48 hr.	3 days	7/24/33	Shiga	2	M
29	Moderate	7/13/33	7/13/33	6 hr.	1 day	7/15/33	Shiga	7	M
30	?	6/10/33	6/10/33	?	?	?	Shiga	Adult	F

is discarded now by most men. Both Duval[7] and Silverman[8] of New Orleans recommend the use of an autogenous vaccine given in large doses in all the chronic cases.

After reviewing the above considerations, we decided upon the following routine which was instituted in June, 1932, in the Children's Department of the Memphis General Hospital and the Children's Department of the Baptist Memorial Hospital and by a few selected private physicians: Every patient with bloody diarrhea entering the charity service of these institutions was to be given sodium thiocyanate, 20 mg. per kilogram of body weight, intravenously, the daily dose not to exceed 1 gram. If there was no improvement, the intravenous injections were to be repeated for three successive days, never longer.

In addition, the recognized forms of treatment, such as, maintaining the fluid balance, blood transfusion, opium, and proper diet were to be maintained. No other specific form of treatment was to be used. All persons exposed by direct contact with the patient were to be fed the drug by mouth, 1/3 grain, 60 mg., per kilogram for three successive days. In none of our cases has the total dose of thiocyanate exceeded 1 gram. There have been no toxic reactions in our series, not even the toxic rash which is sometimes seen. The experiment has now extended over a period of two years. Tables II, III, IV, V and VI give in detail the results; our conclusions follow.

TABLE VI

MORTALITY OF CASES TREATED WITH SODIUM THIOCYANATE

	TOTAL CASES	DEATHS	MORTALITY
Massey's Series	25	1	4
Memphis Shiga	17	6	35.3%
Flexner-Strong	9	3	33.3%
Proteus	2	0	0
Negative Cultures Clinically Dysentery	18	1	5.5%
Parenteral Diarrheas	2	0	0
Total	73	10	13.7%

SUMMARY

Seventy-three cases of bloody diarrhea are reported in which 20 mg. per kilogram of body weight of a 2 per cent solution of pure sodium thiocyanate (rhodanate) was given intravenously. Some of the patients were given but one dose; others as many as three successive doses depending upon the clinical manifestations following the first injection. In addition all persons in direct contact with the patients were given 1/3 gr. of the pure salt for each kilogram of body weight daily in broken doses of three successive days. In several instances where there was a history of contact and the individual showed slight

early symptoms, such as diarrhea, pain in the abdomen, or vomiting, the drug was used intravenously in the same dosage as recommended for treatment for the purpose of prophylaxis.

The mortality for all patients given the drug was 13.7 per cent. Of the seventeen cases of Shiga dysentery which were treated in the Memphis hospitals during 1932 and 1933 with thiocyanate, the mortality was 35.3 per cent. None of these patients received the drug within the first twenty-four hours. In the epidemic which occurred in Osceola, Ark., in 1933, twenty-five patients were given the drug by Dr. L. D. Massey. Practically all of these patients received the drug within the first twenty-four hours; there was prompt decrease in the number of stools and the amount of blood present in them. Concomitant with this result was rapid decrease in toxicity. Of the patients treated in the Osceola epidemic only one who received the drug died. Five patients who did not receive the drug died. No definite benefit was seen from the administration of the drug to nine patients with Flexner-Strong dysentery or to eighteen patients with clinical dysentery who had negative stool cultures. However, the drug was administered late in the disease in practically all of these latter cases.

CONCLUSIONS

1. Sodium thiocyanate (rhodanate) in the dosage of 1/3 gr. per kilogram of body weight orally seems to have definite prophylactic value in Shiga dysentery.

2. If given intravenously in the dosage of 20 mg. per kilogram of body weight on successive days within twenty-four hours after onset in Shiga dysentery, sodium thiocyanate (rhodanate) seems to have marked beneficial effect.

3. Sodium thiocyanate (rhodanate) does not appear to influence dysentery due to other strains. However, these types of dysentery are usually mild in onset and in all of our work have been in progress several days before being seen.

4. Tables II and III indicate that the drug does not influence either the course of the disease or the mortality when it is given as late as thirty hours after onset. It is probably of little value when given after twenty-four hours. Table IV would seem to indicate that when the drug is given early, not later than twenty-four hours after onset, it has a decided value in influencing both the mortality and the severe toxic course of Shiga dysentery.

5. Our mortality experience with the new treatment in the charity services of the Memphis General Hospital and Baptist Memorial Hospital has not shown a material improvement over previous years. This is attributable, in our judgment, to the fact that the cases in such services are rarely seen until the disease has been in progress for

more than twenty-four hours. It is noteworthy that in the Osceola epidemic (private cases) where the drug was administered at the first appearance of diarrhea, only one patient in twenty-six died. The effectiveness of sodium thiocyanate therapy clearly depends upon its early use.

6. No claim for sodium thiocyanate (rhodanate) as a specific, either in the prevention or in the treatment of bacillary dysentery, is made by the authors as a result of this brief clinical experience. Our preliminary results, however, lead us to believe that our method of treatment is worth further trial, and we hope to publish at a later date a much more complete clinical report in which a larger number of institutions and physicians have participated.

We wish to extend our thanks to Dr. L. D. Massey, Osceola, Ark., and Miss Helen Peck, chief of the clinical laboratory division, Baptist Memorial Hospital, for their assistance in this clinical presentation.

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THE PULMONARY LESIONS ASSOCIATED WITH INTRAUTERINE ASPHYXIA

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ASPHYXIA is the most frequent and the most important of all pathologic processes. This is true because respiration—the exchange of oxygen and carbon dioxide and the production of energy—is the most fundamental process of life." (Yandell Henderson.[1]) In utero the fetal blood contained in the placenta is constantly undergoing the changes that in the adult occur in the lungs. Any interference with the placental circulation results in varying degrees of intrauterine asphyxia characterized anatomically by petechial to fairly large hemorrhages in most of the organs of the body and serosanguineous transudates in the serous cavities.

In recent years certain of the pulmonary lesions associated with intrauterine asphyxia have received much consideration. In 1931 Farber and Sweet[2] reviewed the controversial literature concerning intrauterine asphyxia as a cause of premature respiratory movements in utero and stressed the fact that the presence of amniotic sac contents in large quantities in the lungs of asphyxiated infants indicates the occurrence of such premature attempts at respiration. That the aspiration of amniotic fluid, especially if it is infected, may have an added significance as a cause of antenatal pneumonia has been emphasized by Thaysen,[3] Browne,[4] Johnson and Meyer,[5] and Warwick.[6] It would seem therefore that a more general consideration of the various pulmonary lesions that are found in infants who present either clinical or anatomic evidences of asphyxia might be valuable. The following study describes the various pulmonary lesions found in asphyxiated stillborn and newborn infants and endeavors to show the relationship between these lesions and the conditions of asphyxia.

MATERIAL AND METHOD OF STUDY

The study is based on 100 consecutive autopsies performed upon infants stillborn or dying during the first two weeks of life. In this series thirty-eight were stillborn, thirteen of whom were premature; sixty-two were newborn, twelve of whom were premature. The great majority of these necropsies were performed by the writer. They were

From the Hoagland Laboratory, Department of Pathology, the Long Island College of Medicine.

conducted with as much care and thoroughness as is customary in the examination of adult bodies in an effort to reduce the number of unexplained deaths to a small figure. The Benecke technic[7] was used in opening the skull, thus avoiding any unnecessary postmortem destruction of the falx cerebri and tentorium. The base of the skull was examined for fractures, while the spine was examined both for fractures and separation of the vertebrae. After careful examination in situ of the thoracic, abdominal, and pelvic organs, these were removed in toto. They were then studied from their posterior aspect so that lesions of the adrenals, kidneys, or ureters could be seen in their normal anatomic relationships. The individual organs were then examined in the usual manner. Microscopic studies were made of all of the tissues including the brain and cord, but especial attention was paid to the lung sections on which hematoxylin and eosin, Gram, Giemsa, and sudan III methods of staining were used.

The clinical data were obtained through the courtesy of Prof. Carl H. Laws, of the Department of Pediatrics, Long Island College of Medicine.

CAUSES OF NEONATAL DEATH

It is generally accepted that the postmortem findings of intrauterine asphyxia, aside from the characteristic petechial serosal hemorrhages, are those of an intense venous congestion. The right heart is engorged, and the large thoracic vessels, sinuses of the dura, and hepatic vessels are markedly distended. Edema of the brain and brain stem is also a very common finding in asphyxiated infants. The above anatomic findings, if not explained by some other cause, can usually be supported by the clinical evidence of asphyxia.

In Table I the apparent causes of death as determined by autopsy are listed. In thirty-five cases the usual anatomic lesions of asphyxia were found alone, and therefore asphyxia was considered the cause

TABLE I

APPARENT CAUSE OF DEATH	CASES	CASES SHOWING ANATOMIC LESIONS OF INTRAUTERINE ASPHYXIA
Intrauterine asphyxia (alone)	35	35
Prematurity	25	12
*Intracranial hemorrhages with tentorial tear	9	9
Incomplete tentorial tear (no hemorrhage)	6	6
*Adrenal hemorrhage	6	6
Congenital anomalies	8	4
Infections	4	2
Congenital pneumonia	6	5
Hemorrhagic disease of newborn	1	1
Total	100	80

*It is perhaps significant that all of the cases of intracranial and adrenal hemorrhages showed lesions of asphyxia in other organs.

of death; of the remaining sixty-five cases showing birth injuries or other conditions, forty-five also revealed anatomic lesions of asphyxia.

CAUSES OF INTRAUTERINE ASPHYXIA

Certain abnormal clinical conditions are commonly considered as causes of asphyxia. Their occurrence in the eighty cases that showed anatomic evidence of asphyxia is indicated in Table II.

TABLE II

Breech delivery	20
Coil around neck	10
Prolapsed cord	8
Premature separation of placenta	8
Placenta previa	5
Maternal toxemia	5
Prolonged dry labor	5
Narcosis of infant	2
Unknown	17
Total	80

Instrumental operative interference is not listed as a cause of this pathologic process because when such a procedure was employed the case already presented one of the above conditions which in itself may have been the cause of asphyxia.

THE PULMONARY LESIONS

This series of 100 unselected cases revealed on microscopic examination changes in the lungs that can be described under the following three headings: (1) aspirated amniotic sac contents, (2) desquamative anaerosis, (3) congenital pneumonia.

Atelectasis was not included among the important histologic observations because in this series it was not a prominent histologic feature. The term "atelectasis" which refers to the state of expansion of the lungs is a relatively loose term and may include any condition from partial dilatation to complete nonexpansion of the alveoli. Little information concerning the degree of expansion can be ascertained by gross examination of the lungs. In this series of 100 cases extensive and complete atelectasis was not found in a single instance in the lungs of the newborn or stillborn infants. Even in the case of stillborn infants, while occasional foci showed complete lack of expansion, most of the alveoli were more or less distended by blood, serum, amniotic sac contents, or desquamated pulmonary epithelium. Not infrequently the hemorrhages were confined to small wedge-shaped areas which resembled infarcts.

From these findings one must conclude that most or probably all alveoli are potentially capable of expansion whether the agent be air, fluid, blood, or some cellular constituents. Hence in this series of cases atelectasis was not considered an important factor in asphyxia or

neonatal death, but merely as indicative that the air spaces had not been properly ventilated. A distinction, however, should be made between atelectasis and undeveloped pulmonary tissue seen frequently in premature infants and occasionally in full-term infants.

1. *Aspirated Amniotic Sac Contents.*—Amniotic sac contents were found in 50 per cent of all cases. In 39 per cent they were found in very small quantities. In 11 per cent they were found in large quantities filling the alveolar spaces, ducts, and bronchioles, and in all of these cases there was marked clinical evidence of asphyxia. The most reliable and constant evidence of aspirated amniotic fluid is the presence of cornified desquamated epithelial cells from the skin of the fetus. In

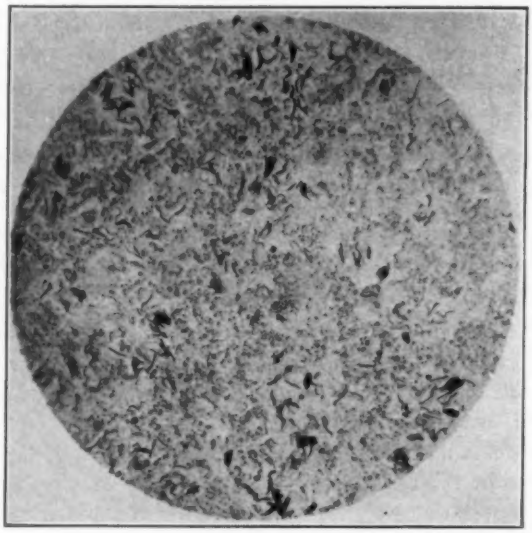

Fig. 1.—Aspiration of amniotic sac contents. The section of lung shows large numbers of cornified epithelial cells in the alveoli.

hematoxylin and eosin sections they may appear as purple-staining irregularly shaped, wavy structures having a wider central portion with pointed ends, if seen from their narrow aspect. On their flat surface they appear as gray- to violet-staining structures having a broad central portion. No nuclei are discernible. Lanugo hairs from the fetus, vernix caseosa, and bile salts are also present at times.

When large quantities of amniotic fluid were found in the lungs, the amount of mucus in the trachea and bronchi was notably less than in the other groups of this series; an observation the significance of which will be discussed below. The following case illustrates the aspiration of large quantities of amniotic sac contents.

Baby R., a stillborn infant, weighing 3,400 gm. was delivered spontaneously as an LOA after 16¾ hours of labor. The fetal heart was not heard for several hours before delivery. There was a loop of cord twisted around the right knee and leg. At autopsy the mouth, larynx, trachea and bronchi contained a small amount of yellowish brown, gelatinous, mucoid material. Microscopic sections of the lungs revealed large quantities of desquamated cornified epidermal cells (Fig. 1).

2. *Desquamative Anaerosis.*—The term "desquamative anaerosis" is proposed as being descriptive of that form of pulmonary lesion noted in asphyxia in which large quantities of desquamated epithelial cells are found, not only occluding the bronchioles and ducts, but completely filling and distending many alveolar spaces. DeLee,[8] in a general discussion of asphyxia neonatorum, suggested that the term "anaerosis"

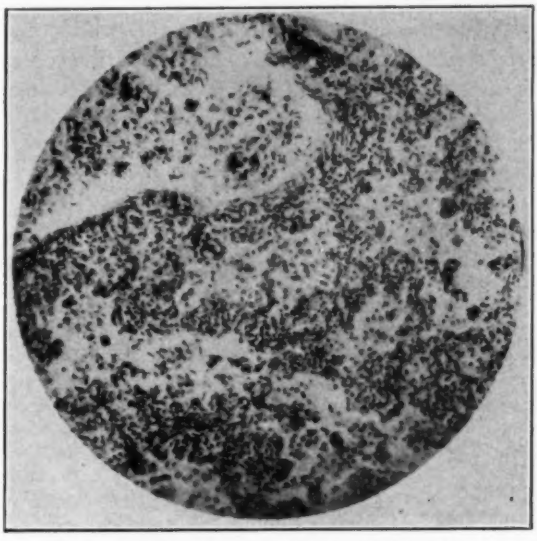

Fig. 2.—Desquamative anaerosis. Desquamated bronchiole epithelial cells filling a bronchiole and adjacent alveolar spaces.

be substituted for "asphyxiation" which is etymologically incorrect because it means without pulse. The term "anaerosis" from *an,* privative + *aer,* air + *osis,* condition of, expresses the state of the infant. The qualifying term "desquamative" which I have added, describes the pathologic process which, as will appear later, may be both a result and a cause of asphyxia.

In these cases there is an intense congestion and edema of the submucosa which results in cloudy swelling and fatty degeneration and even detachment of the bronchial epithelial cells. During respiration the detached mucosa may fold upon itself, or a complete telescoping of the mucous membrane may result thus obstructing the bronchi or bronchi-

oles. In microscopic sections the lumina of some of the bronchioles were occasionally found to be plugged by a complete ring of bronchial epithelium which undoubtedly had become separated from its submucosa. A much more frequent and serious consequence of epithelial desquamation consists of the filling of the smaller air passages and particularly the alveolar spaces with these desquamated cells.

A pink-staining membrane was frequently found lining the small bronchioles and alveolar ducts in cases of this group. This appearance was attributed to degenerative changes in the lining epithelium and the accumulation of cellular débris containing fat droplets, a feature which will be discussed below.

This group of cases showing desquamative anaerosis, of which eighteen were newborn, comprised 31 per cent of the entire series. As the term implies, these cases were always associated with a marked degree of intrauterine asphyxia. The following case illustrates this pathologic condition.

Baby E., a stillborn infant, weighing 2,360 gm., was delivered spontaneously after the mother, a multipara, had had three eclamptic convulsions. She was admitted by ambulance, and no history of the first and second stages of labor could be ascertained. The third stage lasted one-half hour. At autopsy a few cubic centimeters of blood-tinged fluid were found in the peritoneal cavity and pericardial sac. Numerous petechial hemorrhages were found on the epicardial surface of the heart. Many small pial and subarachnoid hemorrhages were found. There were superficial tears of the tentorium on both sides, but no gross hemorrhage was noted. The brain and cord showed edema. The gross appearance of the lungs was not unusual for a stillborn infant except that the mucous membranes of the trachea and bronchi were deeply congested. Microscopic sections of the lungs showed large quantities of desquamated bronchial epithelial cells in the smaller air passages and completely filling and distending many alveolar spaces (Fig. 2).

3. *Congenital Pneumonia.*—This group includes those cases of stillborn or newborn infants dying during the first two weeks of life, who showed an acute inflammatory exudate in the lungs. No instance of "pneumonia alba" of congenital syphilis was encountered. In the series of 100 cases reported here, only 6 per cent showed definite pneumonia, and of these only one case occurred in a stillborn infant. In the lung sections from infants in whom there was no pneumonia, bacteria were rarely found (4.1 per cent), whereas in 83 per cent of the pneumonia cases bacteria were demonstrated. Of this latter group the only case of pneumonia in which no bacteria were found was in the stillborn infant. The organisms consisted of gram-positive bacilli and cocci frequently arranged in clumps and often enmeshed in the débris of the smaller bronchioles and alveolar ducts. In two of the cases bacteria were also found diffusely scattered throughout the alveolar spaces. No bacteria were found in the lumina of the blood vessels. Amniotic sac contents were found associated with pneumonia only occasionally

and then in very small amounts. Only one case, a stillborn infant, showed a considerable collection of this material. The following case is typical of this group.

Baby T., a premature infant of 7½ months gestation, was delivered spontaneously following one hour and fifteen minutes of labor. The mother, a para v, had diabetes and nephritis. Resuscitation of the infant was spontaneous, and it had a strong cry. The infant vomited repeatedly after birth. On the third day he developed severe cyanotic attacks and expired. At autopsy numerous small subpleural hemorrhages were found in both lungs. On section the lungs were found to be atelectatic in appearance and fleshlike in consistence. No gross evidence of pneumonia could be seen. The adrenals were hemorrhagic and the remaining organs showed marked congestion. Microscopic section of the lungs revealed a purulent

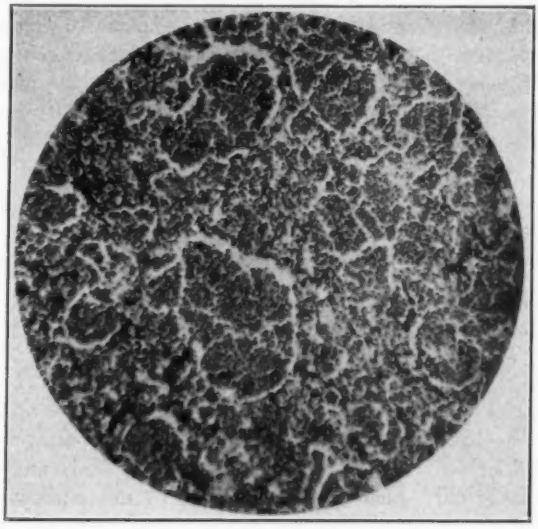

Fig. 3.—Congenital pneumonia. An acute purulent exudate in the bronchioles and alveoli.

exudate in the bronchi and alveolar spaces in which bacteria were found. No amniotic sac contents were noted. The microscopic lesions were patchy in distribution (Fig. 3).

DISCUSSION

Of the sixty-two cases of newborn infants dying within the first two weeks of life, fifty showed clinical evidence of asphyxia. Of the latter, twenty-three cases, or 46 per cent, showed pulmonary lesions, such as aspirated amniotic sac contents and desquamative anaerosis to which postnatal asphyxia might be attributed. In five of these cases large quantities of amniotic sac contents were found in the lungs, and eighteen showed the findings of desquamative anaerosis. As has been shown above both of these pathologic conditions are brought about by intra-

uterine asphyxia, and their persistence in extrauterine life may be the cause of respiratory embarrassment. These processes, therefore, may be both the effect and cause of asphyxia.

Farber and Sweet[2] have given an excellent discussion of the means of recognition and the significance of the occurrence of amniotic sac contents in 88 per cent of their series of 124 infants who had lived from two hours to five weeks. Large quantities of this material were found in 15 per cent of their series. Warwick[6] in 240 consecutive autopsies upon infants, stillborn or dying during the first two weeks of life, found one or more of the constituents of amniotic fluid in 73 per cent of her series.

It is noteworthy that of the cases in my series only eleven, of which five were newborn, showed large quantities of aspirated amniotic fluid in spite of the fact that a great majority of the cases presented evidence of intrauterine asphyxia. When one considers that the mucus in the upper air passages in newborn infants varies in quantity and may be very abundant, it seems possible that, by occluding the larger air passages, it may act as nature's barrier against aspiration of the amniotic fluid. The fact that no such barrier was present in the cases of this group lends support to this theory.

In these eleven cases a small to moderate quantity of desquamated bronchial epithelial cells were also found in the alveolar spaces, but cases in which large quantities of these cells filled the alveolar spaces (desquamative anaerosis) showed little or no evidence of amniotic sac contents.

In my series the findings designated as desquamative anaerosis and interpreted as histologic evidence of asphyxia were always associated with clinical evidence of intrauterine asphyxia. This anatomic diagnosis was made only when large quantities of desquamated bronchial epithelial cells were found in many of the alveolar spaces. This lesion, as previously mentioned, may be an important cause of extrauterine respiratory embarrassment and has therefore an important bearing on the problems of resuscitation. The mechanical respirators, or instruments of the Flagg type[9] designed for the clearing of the upper air passages and insufflation of oxygen and carbon dioxide, may prove inadequate in such cases.

Hyaline membranes such as were noted in the group of cases showing desquamative anaerosis have been studied by several investigators. Johnson and Meyer observed these membranes lining alveolar ducts and sacs in some cases of their pneumonia series and stated that clinically they were cases of "asphyxia neonatorum." Since similar lesions had been found after inhalation of war gases and, experimentally, after intrabronchial insufflation of hydrochloric acid, they thought that this lesion also might be due to the aspiration of an irritating substance.

They injected lysol and soap, agents sometimes used in lubricating the vagina, intratracheally in rabbits but could not produce the typical lesions found in infant lungs. They finally concluded that the material composing the hyaline membrane in infant lungs was derived from epidermal cells and fat aspirated with amniotic fluid, probably sometimes previous to labor. They were unable, however, to produce such membranes by experimental introduction of amniotic fluid into the lungs of rabbits. Farber and Sweet noted these membranes and believed that they were formed by vernix caseosa which had become compressed against the walls of the alveolar ducts and bronchioles. A similar membrane found in influenzal pneumonia was thought by Goodpasture[10] to consist in part of fused necrotic mononuclear cells.

In the present study these membranes were not found in cases of pneumonia and were often observed in cases in which no amniotic sac contents were found, so that infection and the constituents of amniotic fluid can be eliminated as the causes of their production. On the other hand, they were usually associated with marked fatty and granular degeneration and desquamation of bronchial epithelial cells. Fat in fine droplets could be demonstrated in the degenerating cells and in the necrotic hyaline material which the writer believes to be the result of this degenerative process.

The subject of "congenital" pneumonia has in recent years received considerable attention. The significant rôle that aspirated infected amniotic fluid plays in the etiology of antenatal and postnatal pneumonia was first stressed by Thaysen.[3] Thaysen found 8 per cent pneumonia in one series of forty-nine and 42 per cent pneumonia in a later group of thirty-two cases. Browne[4] found pneumonia in 26 per cent of eighty autopsies and also believed that most of the cases of pneumonia in the first few days of life were due to aspiration of infected amniotic fluid. Johnson and Meyer[5] in a study of 500 consecutive autopsies on stillborn or newborn infants reported 19.4 per cent pneumonia cases, and they also indicted aspiration of infected amniotic fluid. Cruickshank[11] found pneumonia in 25 per cent of his series of 800 infants who died during the first month of life. He believes that the presence of amniotic fluid may predispose to the development of pneumonia. A study of 240 consecutive autopsies upon infants, stillborn or dying during the first two weeks of life, was recently reported by Warwick, who found evidence of pneumonia in 18 per cent of the cases, but she was uncertain whether bacteria or irritating amniotic fluid was the etiologic factor involved. Ten, or almost 25 per cent of her series, were stillborn.

In the series of 100 cases reported here only six cases, or 6 per cent, showed pneumonia, and only one case occurred in a stillborn infant. In a number of the cases which histologically showed the lesions of

"desquamative anaerosis" a few red blood cells and leucocytes were found enmeshed with the desquamated cells. These cellular elements of the blood which escaped from the ruptured vessels of the loose, markedly edematous submucosa mixed with degenerated epithelial cells at times resemble an inflammatory exudate. It was also difficult to distinguish the early stages of active inflammatory hyperemia from the mechanical congestion unless a local leucocytosis was present.

The percentage of cases interpreted as pneumonia might well have been much higher had the diagnosis been made from the study of hematoxylin and eosin sections alone, but the Gram stain revealed no fibrin or bacteria in these pseudopneumonia cases. With the aid of the Gram and Giemsa stains, a number of cases which belonged in the "desquamative anaerosis" group were thus properly classified as of noninflammatory origin.

The fact that amniotic sac contents were absent or present only in very small quantities in 83 per cent of the cases would indicate that the amniotic fluid itself was not the causative factor of the pneumonia. On the other hand, the presence of bacteria in 83 per cent of the cases indicates the important rôle of bacteria as the exciting factor in these cases. The presence of anatomic lesions of asphyxia and pneumonia in the same cases points to an intimate relationship between intrauterine asphyxia and bacterial invasion. Since bacteria were found only in those infants who died after one to fourteen days and in none of the stillborn infants, it is reasonable to surmise that infection took place at least in some of the cases after birth and not in utero. In a series of infants who lived from two hours to five weeks, Farber and Sweet[2] found that the cornified cells excited extraordinarily little reaction in the lungs, and no polymorphonuclear infiltration was noted except in the instances where infection was also present. Johnson and Meyer injected amniotic fluid into the air passages of rats but were unable to produce pneumonia. It therefore seems unwise to attempt to draw any inference as to the cause of pneumonia in our single case occurring in a stillborn infant that was associated with the presence of considerable quantities of amniotic fluid. This finding merely stresses again the close relationship between intrauterine asphyxia and "congenital" pneumonia. From my study one might conclude that pneumonia of the newborn is not a common finding, but that when it does occur it is usually superimposed on some degree of asphyxia.

SUMMARY

In a series of 100 consecutive autopsies on stillborn and newborn infants, anatomic lesions of intrauterine asphyxia were found in 80 per cent of the cases.

The pulmonary lesions found in these eighty cases have been described under the following headings:

1. Aspiration of large quantities of amniotic sac contents (11 per cent)
2. Marked desquamation of bronchial epithelium for which the name "desquamative anaerosis" is proposed (31 per cent)
3. Congenital pneumonia (6 per cent)

Atelectasis was not a prominent feature in this series of cases.

The relationship of these lesions to asphyxia has been discussed, and the origin of the hyaline membrane seen in the bronchioles in certain of these conditions has been considered.

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GONORRHEAL VAGINITIS IN CHILDREN TREATED BY DIATHERMY

One- to Three-Year Follow-Up

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MY PURPOSE in presenting this small series of cases is twofold: first, to show follow-up findings in this disease which extended in some cases over a period of three and a half years, and second, to compare the results obtained by diathermy with the results obtained by other more commonly used methods.

Four years ago I became interested in a group of children suffering from gonorrheal vaginitis, who had been treated at the Out-Patient Department of St. Luke's Hospital for periods varying from one to two years. The usual treatment of vaginal instillations of 5 per cent mercurochrome once a week was being used. This stopped the discharge temporarily, and the vaginal smear would become negative; but when the treatments were discontinued, the discharge recurred and the smears would again become positive. In going over the literature in an attempt to find a treatment method which would give a high percentage of permanent results, I was impressed by the work of Cumberbatch[1] of the St. Bartholomew's Hospital, London. He reported excellent results in cases in which diathermy had been used. At that time I thought that it would be worth while to follow carefully a small group of cases over several years in order to check on the permanency of the results.

In January, 1930, we treated our first case, and the last follow-up examination was in October, 1933. During this time we were able to follow fifteen children with gonococcal vaginitis.

Method of Diagnosis.—There is much controversy in the literature on the methods of diagnosis of gonococcal vaginitis. In this series only patients are reported who had positive gonorrhea as judged by the criteria of Neisser, namely (a) demonstration of typical gram-negative diplococci within the leucocytes of the stained exudate and (b) inability to cultivate the organism on plain agar or gelatin. In some cases this cultural diagnosis was checked by obtaining a growth on modified Muslow's medium. The diagnosis was made by the St. Luke's Laboratory in cases there and by the City Hospital Laboratory for the cases in the foundling home. One case followed two years is not included because the laboratory failed to confirm a diagnosis made previously at another hospital.

Principle of Treatment.—The principle of treatment has been outlined by Cumberbatch in his book on diathermy. He states, "In all the cases (of gonorrheal vaginitis) which have been kept under observation, some for a year or more, the results have been permanent.

"The use of diathermy for the elimination of gonococci from the tissues is a rational procedure. In the first place the temperature which will kill the organisms is not high enough to damage the tissues. In the second place, the power of the tissues to eradicate infection is increased by heat. In the third place, the heat generated by diathermy current is not localized to the surface but distributed throughout the infected tissue.

"The action of diathermy on infection is both direct and indirect. In the former the vitality of the organism is lowered or destroyed; in the latter the power of the tissues to eliminate them is increased. It is highly probable that the indirect action is more potent than the direct. Organisms with high lethal temperatures can be destroyed by diathermy without exceeding a temperature that will harm the tissues. Further, it is possible to terminate gonococcal infection by heating the tissues to temperatures which are lower, and for times which are shorter, than those found necessary in experiments on cultures."

Wertheim demonstrated gonococci beyond the epithelial layer; in certain areas they were imbedded deep in the connective tissue. He made sections from the bladder of a child who died while suffering from gonococcal vaginitis and found gonococci between the epithelial cells extending into the subepithelial connective tissue. He also found them in the bladder and vaginal walls.

This would seem to show the folly of using local antiseptics which cannot penetrate deeply and the necessity of using a means of raising tissue resistance.

Technic of Treatment.—The problem of obtaining the cooperation necessary for diathermy treatments in small children was the one most difficult to solve, and it was only by the patient persistance of Miss Reilly, head of the Physiotherapy Department of St. Luke's Hospital, and Miss Dalrymple, nurse in charge of treatment at the foundling home, that we were able to succeed. The matter of getting the child's confidence was a delicate one. As a rule, no treatment was given at the first visit. A smear and culture were made, and the child was allowed to play with the equipment which was to be used. At the next visit the electrodes were applied, but the current was not turned on; usually by the third visit the actual treatment could be started.

For the inactive electrode a piece of moistened sheet tin, 3 inches by 4 inches, was placed just above the symphysis. A Corbus electrode, containing a thermometer, was used as the active electrode in the vagina.

There was no trouble in inserting this even in very young babies. The electrode temperature was gradually raised to 112° F. and maintained at this level for a period of twenty minutes.

The patients in the acute group at the foundling home were given daily treatments, while the ambulatory patients in the chronic group were treated two or three times a week, depending upon their response to treatment.

In several of the cases in the acute group the smears and cultures continued to contain staphylococci. In some of these cases staphlogel, and in others pyridium, was used in conjunction with diathermy to destroy the staphylococci in the vaginal secretions. These surface antiseptics, except in one case, were used only after the smear had been negative for gonococci. In the one case the pyridium suppository in conjunction with the diathermy was successful in giving a consistently negative smear.

Results of Treatment.—Of the fifteen patients whom we were able to follow, ten occurred during an epidemic of acute gonococcal vaginitis in a foundling home while the other five were chronic cases from the Out-Patient Department of St. Luke's Hospital. The acute group and the chronic group are discussed separately.

In the acute series the ages varied from two months to twenty-two months. There was an accidental reinfection of the whole group in this series because of faulty technic on the part of the nurse in charge. This misfortune occurred two months after treatment had been started. At this time the vaginal smears on nine of the ten infants showed only a few pus cells and occasional extracellular gram-negative diplococci with a morphology of gonococci.

These cases were followed for periods varying from nine to thirty months, with the exception of one child who died of tuberculous meningitis three months after being discharged cured.

The time elapsing from the first treatment to the first negative smear averaged 16.2 weeks. This was not a fair test, however, on account of the accidental reinfection referred to, which made additional treatments necessary. The average total number of weeks until the smears were consistently negative was 21.6 weeks. After infection, the time elapsing until a consistently negative smear was obtained was found to average 13.1 weeks.

In the chronic cases the ages varied from one to nine years. These cases with the exception of one were followed for periods varying from one and a half to three and a half years. One case we were able to follow only three months after a consistently negative smear. One case had been treated in the clinic with mercurochrome for twelve months and still had a positive smear.

TABLE I

DIATHERMY RESULTS

Average treatment time required till consistently negative smears	Acute Chronic	10 cases 5 cases	21.6 wk. 4.6 wk.
Percentage of consistently negative smears in series as of final visit	Acute Chronic	10 cases 5 cases	100% 100%
Time required for cure including treatment	Acute Chronic	10 cases *4 cases	9-30 mo. 12-42 mo.
Average time followed after consistently negative smears	Acute Chronic	10 cases *4 cases	12½ mo. 33½ mo.

*One case could only be followed three months after a consistently negative smear.

	NUMBER OF WEEKS TILL FIRST NEGATIVE SMEAR			NUMBER OF WEEKS TILL CONSISTENTLY NEGATIVE SMEAR	
Acute Cases	V D	16	Average 16.2 weeks	20	Average 21.6 weeks
	R M	20		20	
	M L	16		20	
	D C	20		21	
	S E	3		20	
	E W	24		29	
	R M	12		12	
	K S	11		20	
	J Mc	20		25	
	J S	20		29	
Chronic Cases	A B	4	Average 4.2 weeks	4	Average 4.6 weeks
	B L	6		6	
	J W	6		6	
	E S	4		6	
	J P	1		1	

The time from the first treatment to the first negative smear averaged 4.2 weeks. The total number of weeks until the first consistently negative smear averaged 4.6 weeks.

The difference in the time required to clear up the chronic cases in comparison to the acute cases is noteworthy. Treatment in the chronic group seldom extended over two months, while in the acute cases, especially if the condition was present in babies under a year of age, a much longer time was needed for cure. The question arises if perhaps it would not be wise to delay diathermy treatment six weeks in acute cases, or until the body develops some resistance, so as to cut down the number of diathermy treatments.

Comparison With the Results of Other Treatments.—In the *Hospital Social Service Supplement, No. 1,* March, 1933, is a comprehensive report, "Cervico-Vaginitis of Gonococcal Origin in Children."[2] In this excellent summary of the medical and social angles of the problem, the following treatment methods were tried: mercurochrome, 2 per cent, as vaginal instillations, combined vaccines, acriflavine as vaginal instillations, and various combinations of these methods. The statement is made that the newer treatments, such as diathermy, have as yet not

proved of any greater value than the other time-tried methods. A control group was run in this series, and this group received no intravaginal treatment.

We quote from their "Main Findings and Recommendations": "Treatment as tested did not abort the disease. Its course was somewhat shortened by use of instillations of mercurochrome in a 2 per cent aqueous solution applied daily at home, and by mercurochrome in gelatin applied through the endoscope in the clinic. The obstinate character of this disease and its slow subsidence are confirmed. The disease is self-limited and usually fades out within a few months." This paradoxical statement is made in spite of the fact that in their own statistical tables they show that 37.9 per cent of their patients had had the infection for over a year and some had had it for seven years and over.

A chart of their twenty-six acute cases, in which the smear was positive and in which the mercurochrome treatment was used, is found opposite page 34 of the report. An analysis of this chart shows that only sixteen cases had been followed more than a year after treatment was instituted. Of these, nine were treated fifteen months or less; four were treated from fifteen to eighteen months; and three were still being treated after eighteen to twenty months. At the end of a year, four of the sixteen still had positive smears; eight were doubtful; and only four had more than three consecutive negative smears.

A perusal of the results in the twenty-six cases shows that at the end of the twenty-month period six of the patients still had positive smears; five smears, doubtful; eight had less than three consecutive negative smears; and only seven had three consecutive smears and were considered cured.

In percentage, 26 per cent were cured (no mention is made of follow-up to see if they remained negative); 42 per cent were still positive or doubtful; and 30 per cent had less than three consecutive negative smears.

In their series of chronic cases, there were only fourteen with positive smears. Eight of these were treated for a period extending over a year; five were treated fifteen months; and one, seventeen months. According to the chart, at the end of the seventeen-month period there were three cases still positive; five had doubtful smears; five had less than three consecutive negative smears; and only one was cured.

In percentage this would be 7 per cent cured, i.e., three consecutive negative smears, 35 per cent with less than three consecutive negative smears; and 58 per cent still positive or suspicious.

In the control series in which no treatment was used, there were twenty acute cases with positive smears. At the end of thirty months eight were still positive; ten were doubtful; and only two were negative. In the chronic control cases there were only two with positive smears, and

these were negative at the end of the thirty-month period. These items from the tables in the same report disprove the statement that this disease "is self-limited and usually fades out in a few months" and also correct the impression that "old tried methods" are superior to diathermy.

SUMMARY

1. Gonococcal vaginitis in children is not a self-limited disease which tends to fade out in a few months, as has been claimed. Statistics quoted from the article in which this statement is made show that over 37 per cent of the patients in that series had the disease for over a year and that one was supposed to have had it for seven years.

2. Theoretically, diathermy has an advantage over locally applied antiseptics in that it raises resistance in the tissues themselves enabling the body to destroy gonococci deep in the tissues.

3. Practically, in actual results, the diathermy patients had consistently negative smears after twenty-nine weeks in the acute series, and these remained negative during a follow-up period which extended in some of the cases to twenty-five months.

4. The average length of treatment required to give consistently negative smears in the chronic cases was a little over four weeks. The longest follow-up in this group was three and one-half years.

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CONTINUOUS INTRAVENOUS THERAPY IN INFANTS

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THE importance of the continuous intravenous administration of various solutions has long been recognized, and its use, widely advocated. A study of the literature reveals that surgeons and pediatricians have taken the lead in evolving methods and technics intended to overcome the obstacles encountered in this type of therapy. Until recently, surgeons have been far ahead in its use, because of the technical difficulties encountered in its use in infants by pediatricians. A German surgeon[1] writes of "twenty years experience in the use of continuous intravenous infusions." Matas,[2] who used it in postoperative cases, is given credit for introduction of this type of treatment into this country. In the past three years many workers have published the result of their experience. All agree that the procedure is of special benefit in selected pediatric cases, that its use should be more widespread, and that no other therapy is so efficient or acts as quickly.

In 1930, Hendon[3] wrote of this treatment, naming it "venoclysis"; Horsley and Horsley[4] in 1931 introduced a new intravenous cannula; Karelitz,[5] using continuous dextrose infusions in twenty-one cases of toxicosis, reported excellent results and later with Schick[6] reported on its use in treating fifty-three cases of alimentary toxicosis. Hyman and Hirshfeld[7] at first used dextrose solutions and later[8] added blood, various serums, antitoxins, and drugs, such as caffeine and epinephrine in cases of shock, hemorrhage, infection, surgical procedures, and thyrotoxicosis. Stokes[9] concluded that venoclysis has an important place in pediatric therapeutics in combating serious ketosis and stimulating the kidney to a greater functional activity. Bier[10] summed up the advantages of intravenous therapy as assuring accuracy of dosage, allowing ease of administration, giving maximum action in minimum time, and providing more definite results. Brush[11] presented a new method for intravenous infusions in infants by which he attempted to overcome most of the difficulties encountered. Cohen and his coworkers[12] made a comprehensive study of the changes in acid-base equilibrium brought about by intravenous drip and concluded that dehydration is rapidly corrected, that diuresis is reestablished, that nonprotein nitrogen retention in the blood is lessened, and that clinical improvement usually precedes chemical readjustment. Nesbit[13] pointed out the necessity of changing the picture

Read before the Dallas County Medical Society, June 14, 1934.

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of toxemia found in upper intestinal tract obstruction in infants before the necessary surgery is instituted; he stated that this is best accomplished by the absolute rest of the gastrointestinal tract afforded by intravenous therapy.

INDICATIONS

The indications for the use of the continuous intravenous therapy in our practice are those of the loss of or need of body fluids. Dehydration and acidosis are relatively common in many diseases encountered in pediatric practice, particularly in the South during the summer months. The various diarrheas, cholera infantum, alimentary intoxication, cyclic vomiting, and vomiting with acute infections—the toxemia accompanying such conditions as otitis media, pneumonia, dysentery, burns, pyelitis, and marasmus—the postoperative need of fluids as encountered in intussusception, pyloric stenosis, intestinal obstruction, and peritonitis—all give the pediatrician ample opportunity for the use of treatment calculated to replenish safely lost blood volume, to overcome lack of tissue fluids, and to prevent anhydremia, while at the same time providing for rapid elimination of by-products of the infections and preventing the dread anuria.

We have frequently found the introduction of fluids by hypodermoclysis to be inadequate or poorly absorbed. Intraperitoneal fluids may be contraindicated because of an abdominal operation or presence of a large amount of gas in the bowel in patients with respiratory embarrassment such as is frequently encountered in pneumonia. Proctoclysis is a well-known failure in infants. All of these methods are accompanied by discomfort or pain and are undoubtably a strain on the strength of the infant. We have noted with Cohen[12] and others that continuous intravenous administration is, in the great majority of cases, accompanied by quieting of the patient and affording needed rest.

SOLUTIONS

It is not the purpose of this paper to discuss the effect of the administration of various solutions on the blood constituents and body tissues or on the toxic products caused by infection. It is sufficient to say that almost every solution, drug, serum, or antitoxin ever given by vein has been administered as part of continuous venoclysis. Included in this list is the intravenous use of diphtheria antitoxin, magnesium sulphate in cerebral edema, calcium chloride and acacia in nephritic edema, neoarsphenamine, tetanus antitoxin, gentian violet and mercurochrome in septicemia, and typhoid vaccine in chorea.

Our experience is limited to five solutions:

1. Dilute glucose solutions, usually from 5 to 10 per cent dextrose. This is our solution of choice because of its safety in either alkalosis

or acidosis and because it furnishes nutrition as well as fluid. This is especially advantageous when adequate feeding by mouth is difficult or impossible.

2. Physiological salt solution.

3. Hartmann's[14] solution, which is of particular advantage when loss of minerals is evident, as in the diarrheas.

4. Molar sodium lactate, as advocated by Marriott[15] in the treatment of systemic disturbances associated with diarrhea.

5. Occasional infusions of 4 per cent soda bicarbonate solutions in severe acidosis and persistent pyelitis.

We have not attempted to give blood or serum by this method as it would not be feasible with the small needle we use. We have not used stimulants, such as caffeine and epinephrine, because of the belief that the drug would be too dilute to be of value. We have not added various serums and antitoxins to the solutions. We note that this view is shared by others that and the prevalent tendency is to limit continuous intravenous drips to dextrose solutions and solutions containing minerals, such as normal saline or Hartmann's solution. Neither do we advocate the therapy for use in too many conditions, our use having been limited to critically ill patients suffering from lack of fluid. Marriott[15] has shown that complete rest of the bowel in diarrheal conditions can only be accomplished by affording needed nutrition through other channels than the mouth and that this rest of the bowel is considered the most important single factor in treatment. It must be remembered that intravenous infusions are only a part of the scheme of treatment, which must be instituted for the patient. Starvation, medication, removal of foci of infection, diet, and other therapy of choice must be provided.

Our statements concerning the use of this procedure are based on its use in 511 cases. During the summer of 1933, in dealing with cases of parenteral and fermentative diarrhea, dysentery, typhoid, and paratyphoid fevers, we averaged from eighty to ninety intravenous drips per month. In such a large number of severely ill patients, we were naturally able to depend on the clinical picture only, and we were distinctly impressed by the rapidity in the change of condition of many of these infants.

It would seem that little could be added to a therapy already investigated from so many angles, but may we point out that in the reports of all authors quoted and in all other reports we have been able to find, the site of choice for the administration of the continuous intravenous drip was a dissected vein, either in the cubital fossa or more often the saphenous vein of the leg, and that various types of cannulas, catheters, and large needles were inserted. In all of our injections we used a very small needle inserted in a small vein. In one of our cases we gave seventeen separate intravenous drips, exclusive of blood trans-

fusions, over a six-week period of time. May we ask the question, "Could this have been done had our method necessitated cutting down on the vein each time?"

SITE OF CHOICE

For some time before we began using the continuous intravenous drip, we gave all blood transfusions in small capillaries and venules on the back of the hand, dorsum of the foot, and, most commonly, over the scalp. The scalp is by far the most logical choice in the continuous administration of a solution in the vein because (1) the blood vessel is stable; (2) the application is easy; (3) the patient may move or toss the head, the arms and legs being free; and (4) the vessels in this area are the smallest. The last reason is important, as it is our contention that the greatest difficulty in the use of continuous intravenous administration, i.e., clogging of the needle or cannula by blood, is thus overcome. The pressure within the large vein is enough to force a small amount of blood back into the apparatus, and after a few hours obstruction is the rule. We have found that an extremely small vessel approximately the size of the needle will both accommodate the flow and prevent blocking of the needle. It is as easy to insert a small needle into a small vein as a cannula into a large vein.

There are other logical reasons for choosing this site. It does not offer the danger encountered in injections into the superior longitudinal sinus, into which injections should not be made by other than an expert; it does not offer the possibility of a hematoma with resulting infection and necrosis of tissue as sometimes is seen in jugular vein injections; it removes the chance of infection taken in cutting down on a vein. It is almost painless and therefore saves the strength of the already weakened infant. In short, there are relatively no dangers in the method, and it may be done at the bedside.

In looking closely at the scalp, we find many small tributaries of the superficial temporal veins draining the parietal and frontal aspects of the scalp in addition to the two or three small tributaries of the frontal and supraorbital veins, which drain the anterior part of the scalp and flow down over the middle of the forehead. The latter vessels are our first choice, because the child can roll his head from side to side without interfering with the flow of the solution. Shaving the head allows the operator to find these veins more easily.

APPARATUS

The apparatus, with the exception of the needle, has been used many times by others. The infusion is given entirely by gravity. The container is an ordinary 300 c.c. salvarsan tube, connected by a short piece of rubber tubing to a drip bulb, commonly known as the Murphy drip, from which a piece of rubber tubing from 3 to 4 feet in length passes

to a small glass adapter ½ inch in length. The needle, a 28 gauge one-half inch so-called tuberculin needle, smaller than the ordinary hypodermic needle, fits the adapter. It is easy to see that this is a very simple and inexpensive apparatus. The container hangs on the hook of a standard, adjustable in height. This adjustability regulates the rate of flow, which also may be regulated by a screw clamp inserted anywhere between the drip bulb and the needle. After trying several methods of keeping the needle in the vein, we found the simplest and most efficient aid is a 3-inch strip of adhesive tape, 2 inches wide. This is placed firmly over the needle, adapter, and skin directly in front of the needle. A small piece of cotton is placed under the adapter. In case of movement of the scalp, the skin, vein, and needle move together, without disturbing the flow. Such procedures as examination of the ears, mouth, and throat may be carried on without dislodging the needle.

RATE OF FLOW

We have found that the rate of flow is best regulated by raising or lowering the height of the column of solution; there is a possibility of entirely shutting off the flow if the screw clamp is used. The rate of flow is judged by the number of drops per minute; this varies from 5 to 30 drops, the latter being about as fast as the tiny needle will permit passage of the fluid from a column height of three to four feet. The first 200 or 300 c.c. are allowed to enter the vein at a rate of 15 to 20 drops per minute, or from 60 to 80 c.c. per hour; then the rate of flow is usually reduced to 10 or 12 drops per minute and regulated according to the heart rate, the beginning of diuresis, and the clinical appearance of the patient.

TEMPERATURE

The temperature of the solution is not a very important matter. Ordinary room temperature is regarded as safe, but it is our common practice to keep a hot water bag around the container or circling the tubing. The remarkable absence of any untoward reactions to the drip testify as to its margin of safety. We have found that it is best to have the needle sharp with a long bevel. The most common error is inserting the needle too deeply. Frequently the bevel of the needle can be seen intracutaneously while the solution is flowing.

BLOOD TRANSFUSIONS

Blood transfusions are given in the same small blood vessels with the same sized needle. Our transfusion apparatus does not include the drip bulb, but a three-way stopcock is inserted. The blood is drawn from the salvarsan tube into a syringe fitting the stopcock; the valve is turned and the blood injected into the vein slowly. Citrated blood, which is strained when placed in the container, is used. Obstruction of

the needle is rare, but in case this happens, the needle is withdrawn and another is slipped into the vein ½ inch farther down its course. It is the rule for infants receiving transfusions by this method to sleep quietly throughout the procedure. Because of the benefits to the infant, we have adopted the scalp vein route for all intravenous medication.

SUMMARY

1. Continuous intravenous therapy is applicable to many conditions encountered in pediatrics.

2. Our use of this procedure in 511 cases convinces us of its value in indicated cases.

3. We present a method using the smallest scalp veins; the method is easily employed, without discomfort, pain, or danger to the infant.

4. If continuous intravenous drip is not desired, blood transfusions and all other intravenous injections may be given by way of the veins of the scalp.

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HYDROCEPHALUS OF UNUSUAL SIZE

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HYDROCEPHALUS, or progressive enlargement of the cranium with general enfeeblement, occurring in infancy and early childhood, is prevalent enough to have been observed by almost every physician at one time or another. However, it is very rarely that we have occasion to see those unfortunate patients whose heads are of astoundingly huge dimensions. It is the purpose therefore, merely to present a case of this sort, which reveals cranial measurements of unusual magnitude for a child of her age.

CASE REPORT

L. J., a fifteen-month-old white female child, was brought to the hospital Feb. 2, 1934, because of progressive enlargement of the skull. The family history was entirely negative. She was the first born, a normally delivered, full-term baby. At the time of birth a cystic mass was noted at the level of the lumbodorsal spine. This condition was considered to be spina bifida with a meningocele. When the baby was four days old, operation, consisting of complete removal of the mass, was performed and confirmed the diagnosis. The child made an uneventful recovery, the wound healing by primary union. However, the parents were cautioned to measure the head at regular intervals and to note any too rapid increase in size. For seven weeks the baby did remarkably well, her development and functions being perfectly normal. It was at this age that the cranium began to show evidences of cerebrospinal fluid accumulation. The head became progressively larger and the mental status gradually waned until at the time of admission the head was enormous and the child a total mental deficient.

Physical examination revealed a very well-nourished child who was a profound defective and obviously amaurotic. When the infant reacted to pain and temperature stimulation, the cry was that of a normal baby of this age. The head was about the size of a large pumpkin and presented the following measurements:

	CIRCUMFERENCE		DIAMETER	
	CM.	IN.	CM.	IN.
Occipitofrontal	92	36.6	30	12.5
Suboccipitobregmatic	87	35	26	10.5
Suboccipitofrontal	82	33	25	10
Biparietal	—	—	28.7	11.5
Anterior fontanel	20 × 21 cm.			
Posterior fontanel	11 × 11 cm.			

The subcutaneous veins of the scalp were markedly distended and at either parietal region was an extensive area of ulceration, which was probably due to pressure from so great a weight of encapsulated fluid. Obviously, the child was unable to move

From the service of Dr. Louis H. Barenberg, Department of Pediatrics, Morrisania City Hospital, New York City.

its head. The frontal bosses were overhanging, and the eyes, therefore, appeared depressed. The internal epicanthi were markedly distorted because of the lifting of the scalp. The sclerae were bluish and a coarse perpetual nystagmus was noted. The pupils were equally and evenly dilated and revealed a clear media. No circulatory disturbance of the retinae was visualized, but the optic discs appeared pearly white. The ears and nose were normal, as were the chest and abdomen. At the lumbodorsal level of the spine was a nicely healed scar of the operation. Scattered over the vulva and buttocks were several areas of excoriation. The extremities presented a spastic tetraparesis with absence of reflexes.

The laboratory findings were all negative. The urine was normal repeatedly throughout the course of life. The Schick and Mantoux tests were negative, as was the Wassermann reaction. The hemogram follows:

Fig. 1.

Hemoglobin	76 per cent (Sahli)	
Red blood cells	4,400,000	
White blood cells	10,700	
Differential	polymorphonuclears	76%
	eosinophils	2%
	lymphocytes	20%
	monocytes	2%
Smears—normal		
Calcium	10.0 mg. per 100 c.c. blood	
Phosphorus	4.2 mg. per 100 c.c. blood	

Puncture of the spine and cisterna magna revealed 20 mm. of mercury pressure, and following injection of methylene blue into the cisterna the dye appeared within a minute at the spinal needle, which was introduced below the level of the operation.

Radiographic examination of the skull disclosed it to be tremendous in size. The cranium was absent throughout the entire extent except for a few thin portions along the vault, frontal, and occipital regions. The sella turcica could not be definitely visualized because of the enormous quantity of fluid.

The child's course, of about six weeks in the hospital, was uneventful until a few days before death, when she developed a bronchopneumonia. During the interim

she had neither gastrointestinal nor cardiorespiratory disturbances. The intercurrent infection was moderately severe and in three days she died.

Necropsy

The calvarium was composed of relatively small amounts of bone. The dura was easily separated, revealing a soft, tense cerebral surface on which the blood vessels stood out very prominently. The convolutions were completely flattened. The brain tissue was very friable and varied from ¼ to ½ in. in thickness, being thinnest at its vertex. The cerebral surface was punctured and 375 oz. (11,250 c.c.) of a clear, colorless cerebrospinal fluid was obtained. With its removal, the shell of brain tissue collapsed. Aside from this thin shell of cerebrum, no other brain tissue was present excepting the cerebellum and the pons.

The whole brain resembled a cystic sac about the size of a watermelon and presented an internal hydrocephalus. The spinal cord was also removed and showed a small opening at its lower end in the region of the fifth lumbar vertebra, which opening was covered over by a thin fibrous band.

The lungs were free in the pleural spaces. There was marked basal congestion. On section the base of the right lung was purplish in color and completely atelectatic. The base of the left lung showed areas of grayish infiltration which were lobular in distribution. The heart was normal.

When the abdomen was opened, a small excess of dark amber fluid was noted. The mesenteric glands were larger than normal, and the serosa of the intestine was somewhat injected. The liver showed cloudy swellings, and small areas of fatty vacuolization were seen. The spleen was enlarged and grayish red in color. Both kidneys were normal although the pelves were dilated and the mucosa injected and granular. The remainder of the examination was entirely negative.

COMMENT

The case of hydrocephalus presented is probably one of congenital origin, but the question arises as to the relationship between the removal of the meningocele and the production or presence of the excessive cerebrospinal fluid. It is the common belief that excision of a meningocele stimulates the production, or is followed, by a "water head." Whether the removal of so small a portion of the arachnoid, in other words, reabsorbing surface for cerebrospinal fluid, is sufficient to cause an imbalance between production and absorption of the fluid is still an open question. Dandy[1] says: "Hydrocephalus frequently develops after removal of such a lesion, particularly the spinal meningocele, but doubtless its disclosure is purely incidental. Hydrocephalus, if it later develops, was unquestionably progressing when the meningocele was removed but had not yet given evidence of its presence by enlargement of the head."

It is amazing that in cases of such tremendous size, in which the brain has become so markedly distended, as in this case, function still persists. There is, of course, less compression in infancy, in as much as the open sutures, fontanels, and soft bones yield more readily to the progressive expansion.

Holt suggested that if the head grows more than one inch a month, there can be little doubt of hydrocephalus. These cases of congenital hydrocephalus only rarely exist beyond one year of age. At any early stage of the disease it may become arrested spontaneously and the patient attain adult life, but in most cases it is progressive, and death occurs either through inanition or some intercurrent infection.

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Pediatric Clinics

THE HOSPITAL FOR SICK CHILDREN, GREAT ORMOND STREET, LONDON

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IN THE middle of last century Dr. Charles West, a well-known and philanthropic physician, with various friends to help him including Sir Henry Bence Jones, an eminent physician of the day, having decided that the conditions under which sick children were treated in London fell far short of what should be, determined to start a hospital entirely for children. A commodious old house in Great Ormond Street, once the home of Dr. Mead, Physician to the Court of Queen Anne, was acquired, adapted, and opened in 1852, with ten beds. The president was the famous Lord Shaftesbury, and it may be said that right from those early days the Hospital has always attracted the services on the lay side of distinguished men and women. Charles Dickens was a warm supporter of its work, and today H. R. H. the Prince of Wales is the keen holder of the presidential position.

The ten beds soon proved inadequate. Adjoining houses were purchased, but these, too, proved insufficient. By 1860 the annual number of in-patients was 384, and out-patients, 8,800. In ten years there was another big increase, and adjoining land was purchased so that the first buildings specially designed as a hospital unit could be created. These buildings and wards of the '70's form to this day the main block of the Hospital. Still the work grew, and in 1893 the new South Block was opened with due ceremony by the Prince and Princess of Wales (afterwards King Edward and Queen Alexandra) who had always shown a keen interest in the Hospital. Ten years later the first Lord Astor most generously gave an entirely new and up-to-date out-patient department in memory of his daughter. Then two adjoining early eighteenth century houses were acquired as accomodation for nurses, and finally, a few years ago, the first part of the great new reconstruction scheme was launched with the erection and completion this year of a new nurses' home on the north of the present site. It is planned to build the whole hospital in the course of the next few years in accordance with modern needs, for it must be realized that buildings dating from the 1870's leave much to be desired as regards equipment and accomodation.

This brief sketch of the Hospital's bricks and stones, however, is only part of its history. Great Ormond Street has become known all over the world because of the work it has done in the field of paediatrics. Those of us who, as junior members of the staff, can look forward to the new buildings are mindful of the fact that in these old wards and laboratories was laid the foundation of modern knowledge of many disorders. Sir William Jenner, for example, did much to elucidate the mysteries of rickets, and he pointed out the lines of its successful treatment long before vitamin D was discovered. It was in the old wards, too, that Cheadle clearly recognized the nature of infantile scurvy and established the method of treatment still in vogue. Sir Thomas Barlow followed this with his classical investigation into the

*Physician to the Out-Patients at the Hospital.

pathology of the disease, and the pathologic museum today contains the original specimens upon which Barlow based those conclusions which have resulted in his name being attached to infantile scurvy all over the world. Also in the old buildings was worked out the pathology and clinical features of Still's disease and also by Still, the bacteriology of postbasic meningitis. On the surgical side, Sir William Arbuthnot Lane performed many of his famous operations in this hospital; Sir Charles Balla..ce carried out his pioneer work on mastoid disease; and Mr. Waugh devised his method of removing tonsils by dissection, which has spread all over the world.

The Hospital undertakes a vast volume of work. More than 7,000 in-patients pass through the service each year while new out-patients number annually 32,000, entail-

The Hospital for Sick Children, Great Ormond Street

ing over 110,000 attendances or between three and four hundred children every working day. The main building has 252 beds, mostly in eight large wards, four for medical and four for surgical cases. Isolation wards also exist, including a complete and separate unit for the treatment of venereal disease, but there are no special wards for babies, each main ward taking a limited proportion of children under two years. There are in addition seventy-five beds at the Country Branch of the Hospital at Tadworth, Surrey (near the famous race-course where the Derby is run), and it is proposed to increase gradually the number of beds in this convalescent section. There are pathologic, research, biochemical, and electrical departments at the main hospital, a library (containing many old books on paediatrics), and a museum full of historical specimens and up-to-date material. The out-patient department comprises (1) a large casualty section with isolation rooms for the chief

infectious diseases and an operating theater for minor surgery; (2) the main Astor block with four complete sets of clinic rooms so that four separate members of the staff can work at once, with all the necessary ancillary services of social workers, massage, electrical, and other forms of treatment. Special clinics for child guidance, speech training, asthma, and rheumatism are also held.

The active Honorary Staff consists of four physicians, five physicians to out-patients, six surgeons, a dermatologic physician, ophthalmic surgeon, dental surgeon, a radiologist, and four visiting anaesthetists. There is a director of the pathologic department, biochemist, assistant pathologist, and a research worker attached to this department. The junior staff comprises a resident medical superintendent, medical registrar and pathologist, two out-patient medical registrars, three surgical registrars, a casualty medical officer, two resident house physicians, and two resident house surgeons, these last corresponding to the position of internes.

The Hospital is supported largely by voluntary contributions in addition to certain grants from central funds, payment by public health authorities for certain specific services, and payments made on behalf of patients according to the means of the parents. It is administered by a Board of Management on which, as has already been said, many distinguished friends of the Hospital have served.

The Medical School is under the direction of a dean, and under this organization is included the training of undergraduate students who come from the medical schools of London for definite periods and the whole of the postgraduate teaching which is going almost continuously throughout the year. The Hospital and Medical School are recognized by the various examining bodies including the Universities of Oxford, Cambridge, and London for undergraduate and postgraduate instruction. Such teaching and training is almost all carried out in the old tradition of Great Ormond Street, namely by clinical instruction in the ordinary routine course of the Hospital's work. Ward visits by the more senior members of the honorary staff and out-patient clinics held daily supply a vast amount of varied clinical material. The Hospital by virtue of its unique historical position attracts patients from all over the world, and difficult problems in diagnosis are particularly likely to find their way there. There are also from time to time special courses of lectures and demonstrations dealing with special subjects. The resident appointments are much sought after; young graduates from all over the British Isles and the Colonies actively compete for the six months of office which is regarded as a valuable training. One result of this is that in many towns in the United Kingdom and British Empire the methods and traditions of Great Ormond Street are actively practised and passed on so that it is true to say that children benefit from the teaching of Great Ormond Street who have never been within a thousand miles of its doors.

Research work is partly carried out in special clinics organized for the purpose, as in the recent development of the rheumatism and asthma clinics where all the patients with these diseases are supervised by special investigating medical officers under direction of the visiting medical staff. Research work of a more pathologic nature is pursued by the holder of a special research fellowship, and in the new hospital under consideration it is hoped that it will be possible to provide more facilities for visiting research workers. The bulk of the research at Great Ormond Street has always been in the nature of "clinical research," and the observation of large number of cases of special disorders has yielded much fruit in relation to their correct treatment and management.

The training of nurses has always been a feature of the Hospital's work. One of Dr. Charles West's objects in founding the institution was to secure better nursing of the sick child and today the efficiency and skill of the nurses trained at Great Ormond Street is indicated by the great popularity of the private nursing staff, available and utilized for private nursing in every part of the kingdom. The nurses enter

as probationers and receive three years of extensive practical and theoretical training in the course of preparation for the state examinations for admission to the official Register of Sick Children's Nurses. There is a long waiting list of those who seek this training, and among the senior nurses many seek a further training at a general hospital in order to qualify for the post of "sister" to one of the wards at Great Ormond Street.

The social work of the Hospital, with the large number of in- and out-patients daily treated, is obviously of great importance. The Hospital has six trained almoners, in addition to almoner students, who work in close cooperation with the medical staff. Each year convalescent treatment has to be arranged for over two thousand children in some of the many institutions available at the seaside or in the country. The supply of dental and surgical apparatus, the arrangement for massage and artificial sunlight treatment in local clinics when the patients live at some distance from the hospital, securing the services of district nurses to carry out home treatment and close cooperation with the education authorities, the public health authorities, and the special public assistance committees (for poor relief, etc.) are also part of the social work. In this department also comes the machinery for the follow-up of patients who have ceased to attend, necessitating sometimes the securing of special conveyances and escorts. Since the Hospital is largely supported, as already said, by voluntary contributions for the benefit of the sick poor, it follows that one of the duties also undertaken by the almoner's department is to see that this primary object is not abused. The full facilities of the institution are freely available to all, but those who can make some contribution, however small, are invited to do so.

The records of the Hospital go back to the time of its foundation. Some of Dr. Charles West's original case notebooks, now in the library, are full of detailed observations, and a fine set of postmortem registers contain pathologic descriptions of great value. The use of these records is frequently being sought by statistical research workers.

If there is a note of pride in this sketch (or to the reader a suspicion of boasting or vaingloriousness), that is because all who work in the Hospital for Sick Children, Great Ormond Street, feel that way about their institution. The spirit of enthusiasm and hard work has come down to us from distinguished pioneers. We are proud to receive it and proud to pass it on. In the newly reconstructed Hospital we shall be proud to welcome visitors as we are now in the hope that they, too, may capture something of the spirit which hangs about this particular part of a great city.

Critical Review

DISORDERS OF INTERNAL GLAND SECRETION IN CHILDREN

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IT IS unfortunate that terminology of the literature on the glands of internal secretion is so confusing that it is difficult in many instances to determine exactly what an author is writing about. This confusion and the mistakes which result from it has been greatly increased by the use of the coined names given to various extracts. This led to an editorial in the *Journal of the American Medical Association* (October 13, 1934, p. 1152) in which it is urged that "short descriptive phrases" be used to designate the substance rather than "coined names" which include "synonyms (real and alleged) and trade-marks" as well as the "terms invented from time to time by research workers in many parts of the world." Under the group of estrogenic substances may be included "female sex hormones, estrin (oestrin), follicular hormone, folliculin, theelin (ketohydroxyestrin, estrone), theelol (follicular hormone hydrate, trihydroxyestrin, estriol)," and such trade names as "amniotin, progynon, emmenin and menformon." The only way to avoid the inevitable confusion is to designate the substance and its source: for example, estrogenic substance in the blood, lactogenic factor of the anterior pituitary, follicle stimulating factor, luteinizing principle, et cetera.

The fallacy of assuming that because some effect is obtained in rats or rabbits the same thing will also happen in the human being has again been emphasized. Yet, it is clear that much ground has been covered to advantage and some of the doubtful points about the endocrine glands are less obscure.

Thyroxine.—Anderson[2] reports the use of 3:5 diiodothyronine in doses of 50 to 75 mg. daily in the treatment of high-grade myxedema (presumably adults). He thinks that the drug, which can be obtained synthetically, becomes converted into thyroxine and says toxic symptoms have never been observed from its use. Thompson and his coworkers[30] found that the solubility of the thyroxine used was a factor in its absorption from the gastrointestinal tract and hence its effect on the basal metabolism. This is of practical importance to the clinician.

Lerman and Salter[23] compared the relative calorigenic action of several preparations and found that the amounts of commercial thyroid preparations equivalent to 1 mg. of thyroxin polypeptide or 0.75 mg. of crystalline thyroxin were as given in Table I.

TABLE I

		GRAINS	GRAMS
Thyroxin Polypeptide 1 mg.	Armour & Co. Thyroid	3.3	0.22
	Lederle Laboratories, Inc., Thyroid	3.5	0.23
	Burroughs Wellcome Thyroid	10.2	0.68
	Parke, Davis & Co. Thyroid	2.5	0.17

This data is very important to the clinician since it explains many inconsistencies in results and makes clear the necessity of recording in all records the make of thyroid used. Since the Parke, Davis & Co. thyroid has a calorigenic activity four times greater than the Burroughs Wellcome product and almost one and one-half times greater than Lederle's and Armour's, it should be used in smaller doses to obtain the same effect.

Iodine.—It has been found by various writers that the size of the thyroid gland and its iodine content varies with the seasons in different parts of the country. Low iodine content of the food predisposes to, or causes, goiter. Goiter is even found in Holland, where one would naturally not expect it. Pennick[25] found it especially prevalent in Utrecht. This was attributed to the increase in use of waters taken from the deep strata of the earth (presumably by means of artesian wells) which had a low iodine content.

Kolnitz and Remington[21] made a study of human thyroid glands in South Carolina and found that the weight of the gland was smaller and the percentage of iodine higher than elsewhere. The "summer glands" were heavier and as a result had greater amounts of iodine because the percentage of iodine was practically constant.

Hamilton[12] studied the effect of various salts on the thyroid gland of rats. When they were fed on sodium fluoride, sodium chloride, and calcium chloride, their thyroid gland showed normal histology, but rats fed on sodium iodide showed a flattened epithelium, while those fed on sodium bromide showed hyperemia, follicular degeneration, epithelial desquamation, and disappearance of colloid. Hellwig,[15] on the other hand, was able to cause colloid goiter in seven rats with a diet high in calcium chloride when ten times the physiologic requirements of iodine was added.

Hyperthyroidism.—Lahey[22] considers that hyperthyroidism in children is a little more dangerous from the surgical point of view than intense hyperthyroidism in the young adult. Very young children, from three to five years of age, he says, should be operated in two stages because of excessive reactions. The danger of removing too much thyroid and thus affecting growth and development must be considered. If too much thyroid is removed, therapy cannot completely replace the lacking gland. Too much emphasis cannot be laid on this possible danger, since lack of thyroid as seen in infants and young children often results in myxedema, with failure in growth and mental development, even with treatment.

The interrelationship of the thyroid and pituitary glands have been commented on before. Hertz and Kranes[16] found involutional and atrophic changes in the thyroid glands of animals which had received large doses of pituitary materials for more than a week. These changes were involution and finally atrophy with marked colloid storage. Foster[10] found a decreased iodine content after injection of a saline extract of the anterior lobe.

High cholesterol content of the blood is reported in hypothyroidism of childhood by Bronstein.[4] Julius P. Hess[18] determined the blood cholesterol in twenty-five children between the ages of two months and eleven years. The blood cholesterol level varied from 217 to 129 in these cases. In three children with hypothyroidism the cholesterol was, respectively, 454, 454, and 416. He also observed that the creatine

excretion in two female children with hypothyroidism was diminished or absent except when they received thyroid therapy or creatine by mouth. He feels that this data is useful in diagnosis in childhood.

Parathyroids.—The knowledge of the parathyroid glands has developed and clarified markedly so that it is possible to state that hyperparathyroidism is usually due to an adenoma of the parathyroid gland. There results an increased production of parathyroid hormone and a disturbance in the calcium and phosphorus metabolism. This can be diagnosed by a high level of calcium in the blood, a decreased phosphorus, and an increased excretion of both calcium and phosphorus in the urine. It is thus easy to see why the bones can become demineralized and why, with such a large amount of these salts in the urine, urinary calculi may form.[1]

Recent studies of the parathyroid have shown that its location varies.[14] An analysis of the cases studied showed 7 per cent of the glands opposite the cranial third of the thyroid; 57 per cent, the middle third; 25.6 per cent, the caudal third; and 10.4 per cent were found caudal of the thymus gland. There were four parathyroids in 50 per cent of the patients. Brewer[3] reports four human cases with parathyroids in the thymus. Surgical removal, therefore, should only be attempted after a diagnosis is made in the laboratory, and the surgeon must be prepared to hunt for the gland in unexpected places.

Hertz and Kranes[16] found that animals treated with anterior lobe extracts and pregnancy urine showed more vascular and grossly larger parathyroids than the control group. They showed histologic changes consistent with hypertrophy and hyperplasia. Parathyroid hormone was demonstrated by Hoffman[19] in the blood of pregnant women after the third to fourth month. It was never found in nonpregnant women.

Pituitary Gland.—The part played by pituitary gland in the endocrine system is assuming more and more importance. Its influence on the thyroid has been studied from various angles. The injection of alkaline or acid extracts of the anterior pituitary gland into animals has been shown by Hertz and Kranes[17] to cause involution and finally atrophy of the thyroid when continued. This from Collip's[6] point of view would suggest the development of some antisubstance which counteracted the injected material, but from the point of view of the authors it can be explained more reasonably if one infers that the overstimulation of the thyroid causes it to wear out prematurely. This seems to the writer the most plausible explanation.

Changes in the basal metabolism of hypophysectomized dogs were obtained by Houssay.[20] A lowered metabolism was found in these animals which was accompanied by morphologic changes in the thyroid characteristic of hypothyroidism. That this fall in the metabolism was due to the loss of the pituitary and not to changes in the thyroid alone was evidenced by a further fall in the metabolism after their thyroid was also removed. The injection of the thyrotropic hormone of the pituitary into three human subjects was followed, according to Eitel and Loeser,[8] by an increase of the metabolism of 22 to 43 per cent.

Riddle and Bates[26] consider the unsatisfactory nature of tests of the growth hormone "is now the greatest single obstacle to further successful research on the functions and chemistry of the anterior pituitary gland." He finds that a gonad-stimulating hormone can induce growth of the mature testes or ovary beyond the normal size limits in the ring dove.

Engelbach and Schaefer[9] found that libido and potentia disappeared when the growth hormone antuitrin-G (Parke, Davis & Co., not available commercially) was administered to a thirty-four-year-old dwarf and concluded that there must be an antagonism between the sex and growth factors. They also reported growth induced by this hormone in children who had not grown during the previous three months. A study of the evidence is not very convincing because it covered too short a period, and it is well known that growth in height can normally take place in some seasons of the year and be retarded or absent in others.

Pituitary Headache.—It is not clear from Skipp's description[29] exactly what clinical symptoms represent pituitary headache, but he reports success in treating chronic recurrent headaches by injections of pituitrin and pituitrin tablets by mouth.

Undescended Testes.—Sexton,[28] Cohn,[5] and Rubinstein[27] treated boys with undescended testes by means of the anterior-pituitary-like substance in pregnancy urine and obtained favorable results, especially in fat boys. After longer and shorter periods of treatment the testicles of many of these subjects descended into the scrotum. If the results of this method of therapy are confirmed in future cases, an important advance has been made in the treatment of these individuals.

Suprarenal Cortex.—Evidence has been accumulating that there is a relationship between some of the vitamins and the suprarenal cortex.[24] The cortical extract was found to have no influence on avitaminosis A. The experiments showed that "either cortin or some unidentified substance aids in the utilization of vitamins C and B. Since cortical extract retards the onset of the avitaminosis symptoms of vitamins C and B, it is suggested that an ample supply of these vitamins would be advantageous in adrenal cortical insufficiency."

Freeman, Linder, and Hoskins[11] gave schizophrenic patients glycerin extract of the adrenal cortex by mouth in periods of five to thirteen weeks and in doses of 30 grains (2 gm.) to 450 grains (30 gm.) daily and obtained an elevation of the systolic blood pressure of 22 to 34 mm.; the pulse rate and cholesterol level were significantly lowered. They concluded that such extracts were potent by mouth.

DeCourcy and his coworkers[7] made use of subtotal bilateral suprarenalectomy for hypersuprarenalism and were able to reduce the blood pressure and in some cases relieve all symptoms of hypertension.

Hyperinsulinism.—Harris[13] describes this condition as the hunger disease associated with weakness, nervousness, and other manifestations of hypoglycemia. It is the antithesis of diabetes. It has been recorded in children of diabetic mothers and is associated with hypertrophy of the islands of Langerhans. In mild cases the blood sugar ranges between 0.70 and 0.60 with a low sugar tolerance curve. More severe cases may have attacks of petit mal or grand mal. In the writer's experience, however, low fasting blood sugar in untreated epileptic patients is very uncommon. In the severe type of hyperinsulinism, the blood sugar is below 0.50 and readings as low as 0.27 have been found.

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American Academy of Pediatrics

Proceedings

ANNUAL MEETING OF THE EXECUTIVE BOARD

THE meeting of the Executive Board of the American Academy of Pediatrics was held at the Georgian Hotel, Evanston, Ill., Dec. 1, 1934. President Thomas B. Cooley presided, and all the members of the Board were present.

After a thorough discussion of the budget for the year, July 1, 1935, to July 1, 1936, it was decided that it would not be necessary to increase the initiation fee and dues for that period. The list of delinquent members was then taken up and definite action taken.

Question of the next annual meeting was discussed. It was decided that the plans could not be changed now; the meeting will be held at the Waldorf-Astoria Hotel, New York City, June 7 and 8, 1935. It was decided to hold four Panel Discussions, one set of Round Table Discussions, and one business meeting. The Panel Discussions are to last one and one-half hours each, and there are to be two to a session with a fifteen-minute interval between. It was projected to have fifteen Round Table Discussions with a limit of thirty to each group. The contract with the George W. Hale Decorators, Inc., Buffalo, N. Y., for the exhibits, was approved.

As to the future policy with regard to the annual meeting, it was felt that that could best be taken up at the meeting where it could be discussed.

Dr. Cooley reported on his trip to Montreal to meet with Canadian physicians, and the progress made in that section.

Region I.—After discussing applications for fellowships, action on which will be reported in another issue, Dr. Schroeder reported that the next regional meeting would be held in the fall of 1935 in Philadelphia. Dr. Schroeder asked that an outline as to the duties of state chairmen be made. He was informed that a committee in Region III had already proposed to make such an outline and also that the Children's Bureau would be asked to cooperate.

Region II.—Dr. Mitchell asked that he be allowed to call a meeting of the state chairmen of his region in the not distant future to discuss plans. The motion was made and carried that Dr. Mitchell be allowed to call such a meeting; expenses over and above the allowance of the states and region to be covered by the Academy.

Region III.—Dr. Helmholz presented the names of applicants and likewise announced that the next meeting of Region III would be held in St. Louis instead of Cincinnati, so that Regions II and III could hold a joint meeting about the time of that of the Southern Medical Association.

The following additions and changes in the Constitution and By-Laws were recommended:

Article III. Change title to "Powers and Duties of Executive Board, Regional Committees, and State and District Chairmen."

Add Section 4. State, District or Provincial Chairmen. The President shall, on recommendation of the respective regional chairmen, appoint a chairman for each state, district or province, as the case may be, in which the Academy is represented by Fellows.

Section 5. The duties of each state, district or provincial chairman shall be as follows:

(a) To keep himself informed as to the purposes and policies of the Academy and as to conditions in his district relating to these policies.

(b) To promote association and cooperation between the Fellows in his district, to consider with them the problems arising there, and to assist and initiate when necessary activities in furtherance of the Academy's aims and purposes.

Article III, Section 2, shall be changed to read from "at least five members" to "three members."

Dr. Langley Porter, of San Francisco, and Dr. Frank H. Lamb, of Los Angeles, were elected Emeritus Fellows.

Journal of Pediatrics.—The motion was made and carried that the request of the Editorial Board, that Dr. Irvine McQuarrie and Dr. Grover F. Powers be added to that Board, be granted. Also, that the Executive Board was entirely in sympathy with the situation regarding the publication of the Round Table Discussions and that everything possible would be done to curtail the amount of material in these discussions. They agreed that articles read at regional meetings should be submitted to the editors for their action as to publication.

At the request of the Committee on Child Health Relations, Dr. M. Hines Roberts, of Atlanta, Ga., and Dr. George M. Lyon, of Huntington, W. Va., were added to that Committee. The Executive Board approved the following resolution proposed by this Committee:

"That, wherever feasible, the state Academy groups undertake to inform themselves as to

(1) the status of child health activities carried on in their respective states by official and nonofficial agencies,

(2) the provisions for medical care and health supervision of children in institutions or under the care of child-placing agencies and of children in their own homes whose families are unable to pay for medical service,

(3) the medical and health needs of special groups of children scattered throughout the state or concentrated in certain areas or communities, and

(4) the basic facts of mortality and morbidity among children in the state and its political subdivisions, for the purpose of appraising the work done and of bringing about improvement in the health supervision and medical care of children through the cooperation of official departments of health and welfare, medical societies, nonofficial welfare agencies, and lay organizations.

"The Committee on Child Health Relations would be glad to attempt the preparation of a brief outline giving suggestions for such an appraisal of child health activities if state groups desire it. The committee appreciates that certain state groups are already engaged in appraising and developing child health activities and does not intend to suggest any duplication of effort."

The Executive Board also approved the appropriation of sufficient moneys to meet the traveling expense for a meeting of this committee sometime in the near future, time and place to be determined by the chairman.

Dr. Grulee reported that, after a conference with Dr. LeRoy Wilkes in New York, he felt sure that the Committee on School Health and School Health Education would have a definite report in the near future.

It was voted that the Committee on Clinical Investigation and Scientific Research should be granted up to the amount of three hundred dollars to cover expenses between now and the first of June in an investigation to be carried on by that committee.

The Committee on Hospitals and Dispensaries reported that it was in the process of publishing the report on general hospitals and that it would next take up the report on communicable disease hospitals.

It was decided to change the name of the Committee on Relation to the Section of Diseases of Children of the American Medical Association to the Committee on Cooperation with Medical Groups and Societies. It was also decided to appoint a new committee, the Committee on Cooperation with Nonmedical Groups and Societies. The Committee on Cooperation with Medical Groups and Societies was asked for recommendations for a permanent committee for the International Pediatric Congress, which is to be held in Rome in the summer of 1936. The Committee on Cooperation with Nonmedical Groups and Societies, when appointed, will be asked to take up the question of attendance of members of this Society at the meeting of the National Association for Nursery Education.

NEW BUSINESS

It was moved and carried that in the future a check for initiation fee must accompany each application for fellowship.

It was moved and carried that it be recommended to the Academy that after July 1, 1937, no candidate shall be acceptable for fellowship in the Academy who has not been licensed by the Board of Pediatrics.

The question of an auxiliary membership for physicians interested in pediatrics was discussed, but no action was taken.

It was approved and carried that a floating fund for the use of those states whose membership does not bring sufficient revenue to carry on their activities should be established and should be available on application to the Secretary by the State Chairman.

Dr. Helmholz reported on the meeting of the National Society for Research in Child Development, the pediatric section of which he was chairman and Dr. Grulee was secretary. There is every reason to believe that the pediatrist will receive due recognition in this group.

Dr. Grulee reported upon the meetings in Washington of the Committee on Economic Security, Child Health Section.

FOURTH ANNUAL MEETING OF THE AMERICAN ACADEMY OF PEDIATRICS

Round Table Discussion on Prematurity

Cleveland, June 11, 1934.

Leader: Julius H. Hess, Chicago. Assistants: Dr. Ethel C. Dunham, New Haven, Conn., Dr. Warren R. Sisson and Dr. Stewart H. Clifford, Boston, and Dr. Edward A. Wagner, Cincinnati, Ohio.

The Round Table Discussion on Prematurity was called to order at 9:40 A.M. by Dr. Julius H. Hess, chairman.

CHAIRMAN HESS.—The care of the premature infant and his future development covers practically the whole field of pediatrics. There are so many phases to it, many of which cannot possibly be covered in the time at our disposal, that I believe we will make this meeting more valuable by concentrating on a few subjects pertaining to the care of premature infants.

I shall briefly review the work of our station with as little statistical reference as possible in order to open the field for general discussion.

The station at the Sarah Morris Hospital, which was opened in 1922 on a very small scale in one room, now has three large rooms and one small pumping station. The following figures emphasize the demand for such a station in a large city, in fact, in any city: In 1922 we received 19 cases; in 1923, 28 cases; in 1924, 47; in 1925, 66; in 1926, 106; in 1927, 138; in 1928, 167; in 1929, 190, and in 1930, 198; in 1931, 207; in 1932, 249; and in 1933, 208.

I wish to call attention to the decreasing mortality rate beginning with 1928. This is largely accounted for by more complete cooperation of the obstetricians and our sending for the infants to avoid refrigeration. We had a total of 1,623 cases, prematurely born infants, and of these 1,135 lived and 489 died. The mortality rate for all admissions is approximately 30 per cent, with our graduates numbering 70 per cent. Furthermore, we took in quite a number of full-term immature infants. Approximately 90 per cent of all admissions were charity cases, representing in considerable part the lower level of society in a large city. The annual increase in the number of infants cared for offers the best evidence for the demand for similar stations.

What we have tried to demonstrate is that these babies can be taken care of and that you can have a fair degree of success in the rearing of them with a minimum of equipment.

Our rooms are equipped with electrically heated, water-jacketed beds, DeLee heated tables, scales, small wet and dry bulb hygrometers, and thermometers registering high and low room temperatures. We also have a time clock, which we think is very essential, because we know when the nurse has registered the individual feeding time of the infant on the clock she must be awake, and as a consequence we know she probably feeds the baby.

We believe our greatest success is due to the fact that we have a nursing corps that, up until recently at least, has changed very little. Our head nurse has working

with her two other graduate nurses on eight-hour shifts. We have a number of nurses for infants who have been there for a considerable period of time. Furthermore, we have nurses in training. Up to about six months ago we required the nurses in training who received the service to apply for it, as a good many nurses are not especially interested in premature infants, and it would have been as much of a hardship on them to take this work as it would be on the babies to have them take it.

We are convinced that breast milk is the all-saving infant food for premature infants. We start all our babies on straight breast milk. We usually have two or three, sometimes as many as four, wet-nurses. Most infants by the third week, depending upon their size, have added to the breast milk a certain amount of skimmed lactic acid milk. We use either cultured lactic acid milk or powdered lactic acid milk. We add the lactic acid milk to increase the protein content of the mixture.

We had 1,623 premature infants, of whom approximately 70 per cent graduated. There were 1,423 who survived the first twenty-four hours; 1,385, forty-eight hours; and 1,378, ninety-six hours; with 1,135 graduating. Of those who survived the first forty-eight hours, 81.9 per cent were graduated.

I wish to emphasize the seriousness of refrigeration. We had 266 babies between the years 1922 and 1926, of whom 140 were born in the home, 53.5 per cent of those dying. We had 126 born in hospitals, and only 42 per cent died.

Up to that time we did not send for the babies. Then we started sending for the babies, and there was a considerably lowered mortality for 1927 to 1930. During that period, we had 237 born in the home, with 40.5 per cent mortality, and 259 born in hospitals, with 25.1 per cent mortality.

TABLE I

DATA ON VITALITY OF PREMATURE INFANTS GRADUATED

BIRTH WEIGHT IN GRAMS	TOTAL ADMISSIONS	NUMBER SURVIVING FIRST 24 HOURS	NUMBER SURVIVING FIRST 48 HOURS	NUMBER SURVIVING FIRST 96 HOURS	GRADUATED		PERCENTAGE GRADUATED OF INFANTS SURVIVING FIRST 48 HOURS
					NO.	PERCENTAGE	
Less than 1,000	77	34	26	23	12	15.5	46.1
From 1,000 to 1,500	316	213	200	198	137	43.3	68.5
From 1,500 to 2,000	606	559	552	550	456	75.2	82.6
From 2,000 to 2,500	500	496	492	492	436	87.2	88.6
From 2.500 to 3,000	69	69	69	69	61	88.4	88.4
Over 3,000	5	5	5	5	3	60.0	60.0
Unknown	50	47	41	41	30	60.0	73.1
Totals	1,623	1,423	1,385	1,378	1,135	69.6	81.9

From 1930 to 1934 we had 510 infants born in the homes with a mortality lowered to 24.5 per cent and 352 born in the hospitals with the mortality lowered to 22.5 per cent. Fully 90 per cent of this group were brought in by our own people in a little electrically heated ambulance. Of a total of 382 infants born at home, 272, or 71.2 per cent, were admitted to the hospital within the first twenty-four hours during 1930-1932. Of a total of 272 infants born in the hospital, 207, or 76.1 per cent, were admitted to the station within the first twenty-four hours during 1930-1932.

In our first 1,427 admissions, we had a known history of syphilis either by Wassermann test of the mother, father, or both, or a later Wassermann test of the child (118 cases with thirty-two deaths). Toxemia of pregnancy was one of the most important conditions, with 131 cases of toxemia and thirty-three deaths. Five were complicated by syphilis. Placenta previas totaled twelve. Multiple pregnancy, as might be expected, gave us the greatest number of cases, 322.

Observations at autopsies on 386 cases (488 deaths) included intracranial hemorrhage, 168; syphilis, 23; otitis media, 38; mastoiditis, 10; pneumonia, 70; enteritis, 27.

It is quite apparent that nature has been very kind to the infants with severe intracranial hemorrhage. Eighty-six died on the first day, and 64, between the second and seventh days. One hundred one of these infants weighed less than 1,500 gm.

During the past six years, otitis, mastoiditis, and enteritis have been exceptional findings at autopsy.

We all want to know what happens to the infants after we get through with them. We have records of a total of ninety-two cases of infants who died after discharge or after graduation. The greatest number of deaths are recorded as pneumonias or other conditions complicated by pneumonia. There were eighteen with uncomplicated pneumonia; three with empyema; six with otitis with pneumonia.

Among 1,134 infants who were graduated, 128 were considered as having had intracranial hemorrhage. Sixty-nine of these had been under close observation during the past four years and have had from one to four physical and psychometric examinations. Of these, forty-two show no demonstrable physical evidence of injury to the central nervous system. Eleven show evidence of severe physical injury with mental retardation in seven, and four show average intelligence. Seven show evidence of moderate physical injury, with mental retardation in four, and three show average intelligence. Nine show evidence of slight physical injury, with mental retardation in two, six show average intelligence, and one is classified as superior.

This study was carried on for the Institute of Juvenile Research, by Dr. George Mohr, and Phyllis Bartelme, Ph.D.

We were much interested in this particular phase of the subject because we wanted to know whether the work we had undertaken was really worth while. In other words, were we rearing a lot of infants who would not make good citizens? Were they actually worth the time and energy expended in trying to save them?

The number of spinal punctures has been reduced by fully 90 per cent in recent years. We formerly thought that spinal puncture was a valuable therapeutic measure in the premature infant. It is not of much value in most cases, especially if there is a very marked hemorrhage.

Saphir and Levinson made a study of intracranial hemorrhages, and they believe the minimum amount of damage was due to the fact that there is a minimum tendency toward organization of the clot. If there is much hemorrhage or severe injury, the infants die.

Emergency Therapeutic Measures.—Oxygen therapy. All infants weighing under 1,200 gm., those showing respiratory and cardiac embarrassment, and all others who, it is believed, might be benefited by oxygen therapy are placed in an oxygen chamber.

During the three years 1931 to 1934, 346 of the 792 infants admitted have been placed in the oxygen chamber. Most of them have been kept there for more than twenty-four hours, and in a few cases for as long as six weeks or more. With a few exceptions the infants were kept in a 40 per cent oxygen atmosphere.

Intraperitoneal administration of fluids, as an emergency measure, is to be avoided because of the dangers of intestinal perforation and interference with the cardiac and respiratory functions. Blood is the only thing we put in the peritoneal cavity, and that not often.

DR. W. R. SISSON (BOSTON, MASS.).—My only reason for being here is to introduce Dr. Clifford and to tell you about the background of the work we started and which Dr. Clifford has organized.

The study of this material which consists of some 900 premature infants really dates back about ten years. It is of the utmost importance that the premature service should be extremely well organized and that one man, if possible, should be constantly in attendance. We have developed at the Boston Lying-In Hospital a premature service of which Dr. Clifford is head and which is manned by internes from the Children's Hospital. A close medical relationship between the obstetric and pediatric services has evolved which has been the fundamental reason for making this work possible.

Better housing has been accomplished in air-conditioned rooms where the humidity and the temperature can be controlled at the most favorable points. I believe the humidity and the temperature alone have not been as important factors as the new building, the new organization, better nursing, and all that has gone with it. A great contribution from the study is the knowledge that premature infants have an optimum physiologic efficiency at a lower body temperature than we formerly believed. They now are kept at temperatures of 97° to 98° F., and progress at this lower temperature perhaps a little better than when their temperatures were kept at a level of 99° to 100° F.

Dr. Clifford has been studying the relationship of prematurity to the general obstetric problem and has created interest in reducing the number of premature births.

The problem of feeding these babies interests me especially. Babies who will not nurse are gavaged as a routine after the second day. As long as they show signs of physiologic prematurity, that is, when their nursing instinct has not developed, and other stigmas of prematurity are obvious, most of the babies are fed at four-hour intervals.

The problem of infection in the care of premature infants is almost a thing of the past in a well-organized clinic.

We have not made a careful study of the babies after they have left the hospital.

We will never get anywhere in the comparison of statistics in the various clinics until we understand what a premature baby is, what a stillborn is, and various other very fundamental terms and methods in order to use the same language.

CHAIRMAN HESS.—Dr. Sisson, have you a permanent nursing force, or are you using all of your nurses that are in course of training?

DR. SISSON.—For the past few years our clinic has been run by a full-time nurse whom we have trained, and now she is as capable as any physician in carrying out all the work of the premature nursery.

We also have nurses, transfers from other hospitals, who are affiliating with the Boston Lying-In Hospital. I spend a definite number of months in the general clinic. With the exception of the supervisor the premature nursery staff changes every few weeks. The routine gavage feedings have been given by the student

nurses, after instructions by the supervisor, without ill effects. We should have probably two graduate nurses because sometimes night supervisors are not as efficient as day supervisors. It is absolutely essential that some experienced person should be in the nursery all the time.

CHAIRMAN HESS.—The reason for that question is that the nursing situation has bothered us very materially, especially as it concerns gavage feeding, since we have more nurses who are in training for shorter periods of time.

DR. O. L. STRINGFIELD (STAMFORD, CONN.).—What size tube do you use?

CHAIRMAN HESS.—We use a No. 12 French catheter. Each baby has an individual catheter, which is marked at three different places with indelible ink. The first mark is the distance from the tip of the ensiform cartilage to the bridge of the nose. The second one is 2 cm. above that, and the third one 2 cm. above that. When the catheter is passed to the first mark, the tip is from 1 to 2 cm. above the cardia. Most of our feedings are done with the catheter at that point without entering the stomach.

The catheter is always passed with the funnel empty. The barrel of an ordinary glass syringe is used as a funnel. If there is marked distention of the stomach, which is recognized if the wall of the abdomen shows the outline of the stomach, the catheter is passed to the second mark. Sometimes it is necessary to pass it to the third mark to empty the stomach of air. The average feeding time is about three minutes. The catheter must be compressed while it is being withdrawn.

Most of the feedings other than those given by gavage are given with a medicine dropper with a little piece of rubber tubing over the end of the dropper.

DR. ETHEL C. DUNHAM (NEW HAVEN, CONN.).—We very rarely use catheter feeding in our clinic because we have considered it dangerous. In view of the mortality rates reported by Dr. Hess, as well as those reported by Dr. Sisson and Dr. Clifford, one will have to admit that it certainly looks as if catheter feeding, as carried out by them, is probably not very dangerous.

Not long ago I visited a hospital where nearly every premature infant was fed by catheter. The impression of those in charge was that the mortality rate was high, but they had no figures to support this belief. The pathologist at this hospital, however, stated that the incidence of aspiration pneumonia was high. I feel that catheter feeding is not an innocuous procedure. It is only when we compile figures and analyze cases that we have a right to say whether it is a good method of feeding or not.

CHAIRMAN HESS.—It is also true that the worst cases, the smallest and the weakest infants, are the ones fed by catheter. We are feeding by catheter those who have not pharyngeal reflex enough to swallow.

DR. EARL W. MAY (DETROIT).—Out of 206 premature infants last year, there were three who we thought at autopsy might possibly have had trouble from catheter feeding. We fed by gavage all those infants who showed difficulties in swallowing during a test feeding with the dropper or Breck feeder.

We have a group of six graduate nurses, who are trained in catheter feeding, for the twenty-four hours so that we can rely on gavage at any time.

CHAIRMAN HESS.—We have a clinic for graduates, and we can account for about 550 of our graduates of the last fourteen years.

Our social service nurse follows them into the home, and when they are old enough, weather permitting, they are brought into the clinic and followed very closely. We used to see much rickets and tetany. They have practically disappeared from our picture. In the case of syphilitic infants our good results have been due to the fact that we have been able to follow them very closely. Within twenty-four hours a nurse is in the home to see that the mother keeps up her breast milk supply. Many of these babies, after three, four, or eight weeks, go home to their mothers' breasts. In the meantime, it is a very profitable thing, because one-half of the breast milk used in the station is furnished by the mothers of these babies. The breast milk supply is for the mother's baby and is usually enough for two or three more babies during the greater part of the time the baby is in the station.

DR. STEWART CLIFFORD (BOSTON).—I would like to clarify one or two points so we can all be talking about the same thing. Dr. Hess's premature station and Dr. Blackfan's at the Children's Hospital are not run in connection with a maternity hospital. In talking over our problems at the Boston Lying-In Hospital with Dr. Blackfan, we have found that what seems advisable for the babies under Dr. Blackfan's care, and probably the babies in Dr. Hess's Clinic may not seem necessary or even advisable for the babies in the maternity institution's premature nursery. The explanation lies in the fact that different types of patients are encountered in the two institutions.

Our babies are transferred to the nursery within a very few minutes of birth, without the factor of exposure and infection being introduced. The group that is treated at the Children's Hospital, and possibly in Dr. Hess's group, may be received after an attempt has been made in an outlying home or hospital to make the best of a premature baby situation. Then in a panic a baby will be rushed in, possibly in extremis, terribly dehydrated, and in very poor condition. Even if brought in immediately, he is exposed to outside infection and possible chilling. Before we can compare methods of treatment and mortality statistics we must be sure we are considering like cases from comparable institutions. The mortality statistics from maternity hospital nurseries should be lower than from a non-maternity institution. If this proves to be true, we should organize obstetric hospitals so they can take care of their own premature babies without the exposure factor and the infection factor, leaving the premature station in the children's hospital to care for those born in stations not properly equipped and the infants born in homes inadequate to meet their needs. The general situation in Boston would certainly be far more grave if it were not for the premature station at the Children's Hospital.

It is essential also that we have some common definition of terms. The reports from various clinics should be comparable and prevent the "whitewashing" of statistics. "Let's have no miracles between friends" is apropos of the premature infant situation, when a hospital can report a premature infant mortality of 10 or 15 per cent. Looking at the figures reported for comparable institutions in different parts of the country, I was struck by the fact that while the premature infant mortality rate a number of years back started at various figures from 60 to 80 per cent, and has been lowered, through the combined efforts of methods such as Dr. Hess has outlined, the plateau seems to be somewhere around 30 per cent, a fixed point below which present methods cannot go.

We have defined as premature, any baby weighing five pounds or less. We also include as a premature infant any baby whose heart is beating at birth, even though

he doesn't breathe and may only take a gasp. In other words, we are trying to get an uncorrected picture of the premature infant situation that will give us a point of attack for future study.

Using this classification, in the past eleven years the premature infant mortality rate was reduced from around 50 to 60 per cent to a level somewhere around 30 per cent. For the past six years, up until last year, our premature infant mortality, the gross, uncorrected mortality, was around 30 to 35 per cent. Nothing we could do, including an air-conditioned premature nursery, which you have heard described, in any way depressed the premature infant mortality beyond that point. We thought when we introduced this expensive air-conditioned equipment, we should see an immediate drop in the premature infant mortality. The mortality for the next year, as a matter of fact, was a little higher than it was the year before.

The premature infants, comprising only 3 per cent of the total deliveries, were responsible for over half of the deaths that took place during the lying-in hospital period. This included only the premature infants that were born alive. The premature infants also compose a large per cent of the stillbirths.

We have been attempting a new approach to a further reduction in this residual mortality. A statistical survey was made of the records of our 900 premature infants showing that over 85 per cent of all the deaths took place in the first forty-eight hours of life. It seems perfectly reasonable that if the premature infants die in the first forty-eight hours of life, no air-conditioned nursery, no system of catheter feeding, no system of nursing care, no system of prevention of infection, no pediatric methods could be of any avail in reducing the mortality. This makes a reduction of the mortality of the first forty-eight hours an obstetric problem.

We found there is a very striking decrease in the premature infant mortality with each 8-ounce increment in body weight. Therefore, if we could increase the body weight merely 8 ounces, we would thereby get a better group of premature infants and, obviously, lower the gross mortality.

We also discovered that the infant during the fifth lunar month gains about 4 to 5 ounces, in the seventh lunar month around 6 to 8 ounces, and in the ninth lunar month anywhere from 10 to 12 ounces a week in utero. One or two weeks' delay in the induction of labor will often amount to an increase in the weight of the fetus from 1 to 1½ pounds. It is quite apparent, therefore, that even a two-week delay will improve the outlook for the premature infant at birth.

The work of Scammon and Caulkins has demonstrated that the occipitofrontal diameter is an accurate index of the age of the fetus. This gave us the idea that if the occipitofrontal diameter of the fetal head could be measured by any method in utero, we would immediately at any period of pregnancy be able to ascertain the fetal age of the infant in utero. A method was investigated and finally, after several years of work, perfected so that by roentgenometric technic we are now able to measure accurately the occipitofrontal diameter of the fetal head in utero. As at the present time we are unaccustomed to thinking in terms of the occipitofrontal diameter, it was necessary to translate that to the term of body weight.

The relation between the occipitofrontal diameter and the birth weight was investigated in over 600 newborn infants, and a graph, which you might be interested in seeing, was prepared so that from any occipitofrontal diameter measurement we can predict the probable maximum and minimum weight of the fetus in utero.

With this accurate knowledge of the body weight in utero, many pregnancies can be prolonged until a more viable baby is assured. On the other hand, in the case of certain complications of pregnancy, when the obstetrician has been leaning

over backward in an attempt to get a viable baby, he will find that the baby is already of sufficient size, that there is no necessity to expose the baby further to the danger of fetal death in utero or the mother to the hazards of a further prolongation of pregnancy, and that pregnancy may immediately be terminated.

We found that 28 per cent of premature babies who were born alive were born of toxemic mothers. We found that, roughly, 12 per cent of the toxemic group delivered stillborn babies, half being premature, who, if delivered the week before, might have had a good chance of living. Therefore, in toxemia, the fetus was found to be exposed to a double hazard: (1) if delivered too early, it would die of prematurity; (2) if delivered too late, the placenta would become grossly infarcted or prematurely separate, and the baby would be stillborn.

In investigating fifty-five cases of toxemia, we have found that the level of the mother's blood pressure may be an index of the probability of the production of a stillborn infant. In levels up to 150, we very rarely encountered a stillborn infant. In the level of blood pressure from 150 to 180, 11 per cent of the toxemic mothers had stillborn infants. When the blood pressure reached 180 or 210, 43 per cent of all the toxemic pregnancies resulted in stillborn infants.

Therefore, if a mother's blood pressure is 200, and the fetal size in utero is from 3½ to 4 pounds, continuing pregnancy and gambling for a larger baby exposes that baby to 43 per cent hazard of being stillborn. We know statistically that if delivered at once the baby at this weight will face about a 20 per cent mortality. Under these circumstances the future of the fetus is much brighter as a premature baby than to be carried on to term with greater chance of being born dead.

It is thus seen that what actually began as a method of reducing the number of premature infants has ended as a method whereby we are actually increasing the number of premature babies, but we are decreasing the number of stillborn babies. Over a ten-year period, the stillbirth rate was at a very high level, but last year for the first time there was a drop of almost 20 per cent in the stillbirth rate. Those babies that were salvaged were the premature babies that, if allowed to continue to term, may have been born dead. Conversely, the incidence of prematurity, that has been going along at a very uniform rate of around 27 per 1,000, increased last year to 34 per 1,000, and the increase, we believe, was largely in the babies that were salvaged from the stillborn group.

A further study was made of the different methods of delivery and their effect upon the viability of the premature infant. We found to our amazement that what was thought to be the safest method for delivering a premature baby, cesarean section, was actually the most dangerous. Fifty per cent of the cesarean deliveries of comparable weight groups resulted in dead fetuses, and the safest possible method for the delivery of the premature baby was the normal delivery with vertex presentation, with low forceps and wide episiotomy. The figures are quite striking for the two different methods of delivery.

Apparently toxemia exerted no direct influence on the premature infant mortality rate. Toxemia, on the other hand, did affect the fetus indirectly. Through involving the placenta, the fetus is poorly nourished and approaches the minimum weight to be expected from its skeletal measurement. If the pregnancy is not terminated in time, toxemia may result in the death of the fetus through the mechanism of placental involvement that has been mentioned.

We found that in cases with heart disease, when heart disease was accompanied by failure and signs of decompensation, the premature infant mortality was 80 per cent. The reason advanced for this high rate is threefold: (1) these patients

had to be delivered by cesarean section; (2) 73 per cent of them received morphine prior to delivery; (3) the placenta and, indirectly, the fetus shared in the failing circulation and was thus unfavorably influenced.

Therefore, in handling a patient with heart disease when there is an 80 per cent mortality for the premature infant when failure develops, it is far better to gamble on the 3- or 4-pound baby a week or so before the mother may possibly break than to gamble for a larger baby and have failure set in.

In this very rapid survey we find that we have been unable by ordinary pediatric methods to bring the gross premature infant mortality below a fixed level; that most of the mortality we have been unable to influence has been that which occurred during the first forty-eight hours of life and therefore was principally an obstetric problem; that there is some prospect of influencing this mortality the first forty-eight hours, and therefore the mortality rate of the premature infant as a whole, through a study of the factors influencing the fetus in utero and determining, if possible, the safest method of delivery, the optimum time for delivery, and so forth. There is opened a whole new pediatric field in which we are extending our frontier to include the fetus in utero. The surface has just been touched; many of the opinions that we at present hold will have to be revised as our experience grows, but the results of the past year are very suggestive that we may be on the right track for really effecting a considerable reduction in the premature infant gross mortality rate.

DR. EARL W. MAY (DETROIT).—We can definitely lower the mortality rate when we handle the babies right from the time of birth, and we have lowered it below 30 per cent. The question of how many hours should be eliminated, twelve hours or twenty-four hours, should be brought up and definitely decided.

We do not feed breast milk at all to the babies of toxemic mothers, tuberculous mothers, mothers with heart complications, and such types. They are fed a formula because the babies, within a short time, will have to be accustomed to a formula. There has been no greater death rate among the formula-fed babies than there has been among the breast-fed babies. When we know that a baby of a toxic mother will eventually get on to the breast, it is fed on fortified breast milk, with 2 to 3 per cent of carbohydrate in the form of dextrimaltose, dextrin, etc., added.

CHAIRMAN HESS.—Dr. Dunham, in quoting your statistics, would you like to bring out that question of what time period we should eliminate in our statistics? I might say that in our charts we have divided them into four groups as follows: all infants received; those that live twenty-four, forty-eight, and ninety-six hours.

DR. CLIFFORD.—The technical description of the method appeared in *Surgery, Gynecology and Obstetrics* in April (Vol. 58, pp. 727-736, 1934). The chart you saw and the application of the method to the determination of the fetal size appeared in *Surgery, Gynecology and Obstetrics* (Vol. 58, pp. 959-961, 1934). A preliminary discussion of the obstetric management of premature labors appeared in the *New England Journal of Medicine* (Vol. 210, pp. 570-575, 1934).

CHAIRMAN HESS.—I am going to ask Dr. Wagner to discuss intracranial hemorrhage.

DR. EDWARD A. WAGNER (CINCINNATI, OHIO).—I shall describe our experience at the Cincinnati General Hospital.

Statistics show that about two-thirds of the newborn infants coming to autopsy show some evidence of intracranial hemorrhage. In sixty-two necropsies on pre-

mature infants at the Cincinnati General Hospital, there were thirty-one instances of intracranial hemorrhage and twenty-five cases of atelectasis.

As the greatest factor in premature mortality, this condition deserves our deepest interest, not only as a cause of mortality but also as related to physical and mental handicap. Although some observers are attempting to minimize the importance of intracranial hemorrhage as the great cause for mental retardation and spasticity, stating that congenital brain defects and encephalitis have been overlooked as causative factors, experience leads us to believe that intracranial hemorrhage is still by far the most common cause.

The newborn are particularly liable to bleed, and premature infants are even more susceptible to hemorrhagic occurrences because of several factors. The brain capillaries are new endothelial tubes without elastic or muscle fiber. Anesthetic drugs may lengthen the bleeding time. Hemolysis of the red cells occurs from the time of birth when the baby is exposed to atmospheric conditions of oxygen tension. Bile salts accumulating are also a factor. Deficient protein intake of the mother during pregnancy is a factor. Hemorrhagic disease as an entity is also a factor. Syphilis and sepsis come as later factors.

Variations in intracranial tension during labor and on expulsion undoubtedly play a rôle. Molding of the head is unquestionably a cause in some instances, as is the sudden springing back of overlapping bones.

Hemorrhages, as you know, occur over the cerebrum, in the cerebellum, in the brain substance, into the ventricles, and sometimes in the medulla, as shown by Hemsath and Canavan. Their interesting observations showed microscopic hemorrhage in the medulla oblongata in 64 per cent of a series of autopsies. In twelve cases an anatomic diagnosis was established which would otherwise have been listed as asphyxia, swallowing of amniotic fluid, or possibly faulty feeding by gavage.

The Roberts' method of injecting, postmortem, mercury or iodized oil into the circulation (the body being x-rayed) after the injection, is excellent for studying the location and extent of hemorrhage. Allen McClure has also elaborated this technic, injecting a substance called "roentgin" in the carotid.

Symptoms.—In the full-term baby, apathy, failure to nurse, irritability, and so forth, aid us in making a diagnosis; in the premature these signs are of comparatively little value for obvious reasons. Fretfulness, failure to gain in weight, and early fever are possibly of some importance. Cyanosis occurring intermittently is of distinct value as a diagnostic symptom. Those infants with continuous cyanosis, frequently have congenital heart disease or atelectasis. Muscular twitchings occur about the eyes and face in about 58 per cent of the cases.

Stern and Schwartz emphasize particularly nystagmus occurring during the first few hours of life.

Convulsions, localized or generalized, suggest the possibility of this condition. Hypertonicity is frequently associated with intracranial hemorrhage and may be so marked that, when we attempt to elicit the Chvostek sign, general convulsions result. Reliance on flacidity is of even greater importance than spasticity. Focal signs are of comparatively little value, and in many cases little dependence can be placed on them for localization.

Signs of intracranial pressure, such as bulging of the fontanel, are of importance. However, in subtentorial hemorrhage a rather flat fontanel or a depressed fontanel may be found.

The eyegrounds are of comparatively little aid in diagnosis. Spinal puncture reveals increased pressure as a rule, up to as high as 50 mm. Examination of the

spinal fluid frequently reveals blood, the finding of crenated blood cells being of the greatest importance. Xanthochromic fluid could be found in other conditions, but frequently occurs in intracranial hemorrhage.

Cisternal puncture is of distinct value as a diagnostic measure, whereas the lateral ventricle puncture is a rather dangerous procedure.

We have particular difficulty in differentiating intracranial hemorrhage from edema and hemorrhage occurring in hemorrhagic disease and hemorrhage occurring in skull fractures.

Most of the prophylaxis of this condition is unquestionably in the hands of the obstetrician.

As soon as the infant is born, we should avoid rough handling, particularly of methods used in resuscitation.

For the last seven years, I have advocated the use of intramuscular injection of human blood as a routine procedure in all premature infants. While it is well known that trauma with labor causes many hemorrhages, there is still a fair percentage of cases without evidence of trauma in which spontaneous bleeding occurs, either as a result of hemorrhagic disease with its lack of prothrombin or incompleteness in coagulating mechanism, or possible sepsis, syphilis, or other causes mentioned before.

In all cases of suspected hemorrhage, it is advisable to test bleeding and coagulation time, and in those cases in which there is a prolongation, repeated injections can be given. The subscapular region is far safer and less painful than the buttocks, and there is less tendency to infection and sloughing. Since instituting this procedure, we have had no instance of hemorrhagic disease in the last 400 cases.

The treatment of intracranial hemorrhage, other than the prophylactic treatment, resolves itself into the use of repeated spinal punctures or cisernal punctures. Other operative procedures, as a rule, are not to be recommended.

DR. DUNHAM.—I would like to ask Dr. Wagner what the incidence of hemorrhagic disease was before he began to use these prophylactic injections of blood.

DR. WAGNER.—I can't give you the exact figures now.

DR. DUNHAM.—Among more than 900 infants in my series there were only three cases of hemorrhagic disease.

DR. CLIFFORD.—One in at least 800, and probably 1,000.

DR. DUNHAM.—So it would seem that the incidence is very low in a large series of cases.

CHAIRMAN HESS.—What did you say the percentage of intracranial hemorrhage was to your total?

DR. WAGNER.—In sixty-two necropsies, there were thirty-one instances.

CHAIRMAN HESS.—About 50 per cent—ours ran a little less than that. I mention that because of the fact that Dr. Blackfan in his monograph reported only eight cases in a total of 163 deaths. Then, looking back in his statistics, I find that only forty-three of his 206 reported were two days of age or less when received. We receive 70 per cent of our infants in their first twenty-four hours of life, which might easily account for the fact that he has such a low percentage whereas you and I, in our clinics, have such a high percentage. Forty-eight and seven-tenths of our deaths occurred in the first forty-eight hours after the infants were received at the station.

DR. DUNHAM.---I want to discuss two subjects: one, the question of mortality from prematurity; the other, the importance of having some graphic way of recording the progress of the infant from day to day.

When the infant mortality rate for fifteen years (1917-1932) is shown in a curve, a satisfactory fall in the death rate under one year is seen. There is, however, only a slight tendency for the neonatal mortality to fall. The mortality under one day is represented by a nearly straight line, practically no reduction of death rate in this age period having been made. Since at least 50 per cent of neonatal deaths are due to prematurity, some reduction in the neonatal mortality rate would in all probability be brought about by improvement in methods for the care of premature infants.

Two years ago I visited 105 hospitals in a large number of cities throughout the United States. All kinds of hospitals were seen, university clinics, general hospitals, and children's and maternity hospitals. In each of these I asked those in charge what sort of results they had in the care of premature infants. In a majority of the hospitals visited, the answer, whether favorable or unfavorable, was not based on figures. In fact, there were only five or six hospitals in which figures were available at the time of my visit. At my request, however, figures have been compiled in a large number of these hospitals and sent to me for analysis.

Before we can draw conclusions as to results of care, however, agreement must be reached with respect to criteria for the diagnosis of prematurity. I will not attempt a discussion of the different methods which have been advocated for determining prematurity because they are all thoroughly discussed in the literature. We must obviously agree on some basis for diagnosis which we can all use. Although for a number of reasons weight is not the most satisfactory criterion, nevertheless, we are almost obliged to use weight as the basis for diagnosis since it is the one measurement almost invariably made. Twenty-five hundred grams, or 5 pounds 8 ounces is the weight that is commonly used as the dividing line between maturity and prematurity.

In the figures I have compiled, I have used 2,500 gm. or under as the basis for diagnosis of prematurity. Stillbirths were excluded. Every live-born premature infant, whether it lived one second or longer, was included.

It is very important, when compiling figures on results of care of premature infants, to consider the infants in different weight groups, because the mortality will vary inversely with the weight of the infant, that is, the smaller the infant the higher the mortality rate. I have used the following weight groups: less than 1,000 gm.; 1,001 to 1,500; 1,501 to 2,000; 2,001 to 2,500.

In the thirty-five hospitals from which I obtained figures there were 2,609 premature infants born, and of that number 957, or 37 per cent, died. The mortality varied between 92 per cent in the lowest weight group (less than 1000 gm.) and 17 per cent in the highest weight group (2,001 to 2,500 gm.).

In one of these hospitals analysis of the data for a period of five years showed that the mortality among premature infants was increasing. This had not been previously realized and created much interest among the staff and brought about changes in their methods of treating premature infants.

In a series of 117 premature infants born in the New Haven Hospital the mortality was found to be 30 per cent, varying between 100 per cent in those weighing less than 1,000 gm. and 4.1 per cent in those weighing between 2,000 and 2,500 gm.

In a short time we hope to have some sort of a program drawn up so that with the cooperation of different hospitals and clinics studies similar to these may be made. A concerted effort to improve methods of caring for premature infants should result in a decrease in neonatal mortality.

Some of us are not dealing with as large numbers of premature infants as Dr. Hess and Dr. Clifford in their clinics. Many of us have much smaller clinics or only a few premature infants to care for in private practice. In discussing the care of the premature infant with individual physicians, I sometimes feel that they are not getting a bird's-eye view, so to speak, of the method of treatment they are using. We have developed a graphic chart which we find helpful, and I am going to try to point out to you the advantages of using some sort of chart even if caring for only one infant. (Chart shown.)

The chart shows graphically for each day of life, the temperature, weight, amount of vomiting, total number of stools, composition of the milk as to percentage of protein, fat, and carbohydrate, and caloric value per kilogram of body weight and total fluid intake. By the use of one of these charts one can see at a glance the point at which the infant begins to show signs such as fever, vomiting, etc., and the exact time relationship between the symptoms and the food and fluid intake on that day. In this way one can often see some slight deviation from the normal before it would be noticed if it was necessary, as with the ordinary case history, to turn over a lot of pages. I do not present this as an ideal chart, but only to point out that a graphic representation of the infant's course is helpful as a guide to treatment.

I wish to add one more point. Some authorities consider breast milk absolutely imperative in the feeding of premature infants; others state that gavage in the feeding of premature infants is life saving; some say that the temperature must be kept normal (98.6° F.), whereas others say that this is not necessary. I do not think one has a right to make any statement unless one has some statistical knowledge of results of different types of treatment. In the New Haven Hospital clinic we use neither breast milk nor gavage as a rule, and I think the mortality rate compares favorably with other clinics where breast milk is used exclusively and gavage is used frequently.

No doubt many of you have very definite ideas about the treatment of premature infants. I hope that you will all compile figures, if you have not already done so, and give us the benefit of the methods used backed by figures on results.

DR. CLIFFORD.—May I just say a word about what seems to be a very minor point, but in reality, from the statistical point of view, is of very great importance; that is whether we take 5 pounds or 5½ pounds as the upper limit of the premature infant.

I can't give you the figures at 5½ pounds, but I can give you an illustration. We have a little more than 100 babies per year delivered in the hospital who weigh 5 pounds or less. We have about the same number who weigh between 5 and 6 pounds delivered per year. The babies who weigh from 5 to 6 pounds have a 3 per cent mortality, and the babies who weigh from 4 to 5 pounds have have an 11 per cent mortality, and thus it increases as the weight decreases. We have had in the whole group of babies weighing from 1 to 5 pounds in the last year a 29 per cent mortality. If we include the babies up to 5½ pounds, we immediately introduce 50 babies with only two deaths, so that on this basis we could claim a premature infant mortality of 20 per cent.

If we are attempting to reduce the premature infant mortality, we will get a more dramatic picture of our results if we limit ourselves to the high mortality range of from 1 to 5 pounds rather than include the ones above 5 pounds who do fairly well anyway. If we want to produce statistical evidence of improvement in the situation, it is just as well to paint the picture as black as it is to begin with.

DR. DUNHAM.—If twins are included in mortality statistics the mortality will be lower, because a twin weighing, for instance, 3 pounds may be mature and has therefore a better chance of survival than a premature infant of the same weight.

CHAIRMAN HESS.—The question of breast milk feeding is really a social problem. In the last year or two our charity cases have run up to about 90 per cent. We used to run about 70 per cent. Some of our babies come from the very poorest homes, and if we can send those babies home on breast milk or have breast milk for them when they get home, it certainly means we are going to have not only a lowered mortality but a decidedly lower morbidity. That is one reason we have made such a strenuous effort to keep up all the breast milk in the homes we can. Also it is economy for us to receive the breast milk from the mothers while their infants are in the station.

What has been said about intracranial hemorrhage by Dr. Wagner and others is only too true. Many of them are not diagnosed as intracranial hemorrhage until they come to autopsy. Again, we diagnose some intracranial hemorrhage which are not. I think the most valuable lessons we have learned have been from our post-mortems. We have had 77 per cent of autopsies.

DR. EARL W. MAY (DETROIT).—We have been using adrenalin now for over a year and a half, and I believe it has lowered our premature infant mortality. We give 1 minim every hour to the very small babies, until they show definite signs of activity. That may be for three or four days, and then we give 3 minims every four hours. To some of our very weak premature infants we give that right along, 3 minims every four hours until they are quite definitely active. Then we give it every eight hours, then every twelve hours, and twenty-four hours, until it is discontinued. I feel that the adrenal glands are not overly active in these very small premature babies.

CHAIRMAN HESS.—We do not feed our infants during the first twelve hours, and when they are in poor condition not for twenty-four or even for thirty-six hours. When they are left at home, there is always the danger that they will be given some form of artificial feeding.

In the four years 1927-1930 the total admissions of newborn and some days older premature infants and immature infants was 718. The deaths due to pneumonia in this group numbered thirty-six.

In the three years 1931 to 1933, when the oxygen chamber was in use, the total admissions of newborn and some days older premature infants and immature infants were 712. Thirty-four of these infants had pneumonia, with eleven deaths.

In the three years 1931-1933, eighty infants who had graduated from the station were readmitted for various causes. Eleven of these infants died. Pneumonia was diagnosed in seventeen and was recorded as the cause of death in five instances.

Summary of Results Obtained With Oxygen Therapy.—Station mortality among 792 infants. Six hundred twenty-eight, or 79.3 per cent, were graduated. Classified as unavoidable deaths were intracranial hemorrhage, 62; congenital anomalies, 18; sclerema neonatorum, 2; syphilis, 4; athrepsia, 4—aged 13, 17, 51, and 57 days on admission, and lived 1 day, 5 days, 3 hours, and 5 days, respectively; and also 44 infants with vitality so low that they did not survive the first forty-eight hours after admission to the station. This latter group included newborns and those several days old upon admission.

This leaves nineteen infants to be analyzed as to the desirability of classifying them as cases in which infections, both primary and secondary, and other pathologic conditions might be directly related to their existence in the station.

Atelectasis: 2 newborn infants—lived four and fifty-eight days.

Pneumonia: 9 cases—7 in newborn infants who died in 6, 6, 9, 12, 23, 38 and 62 days, respectively. The associated pathologic conditions are given in detail elsewhere. Two were admitted at three and five days of age and lived 85 and 49 days.

Otitis media: 2 patients admitted with otitis when 6 and 7 days old, and lived 19 and 7 days.

Pyemia: 4 cases—two newborn, lived 25 and 16 days; one four days old on admission lived 4 days; this infant was in extreme condition when admitted; one admitted when 5 days old with omphalitis and with secondary pyemia.

Cerebral abscess: 1 newborn infant who lived 12 days.

Thrombosis of the pulmonary vein with infarction of lung: 1 newborn infant who lived 16 days.

Among these nineteen infants are two with atelectasis and two with pyemia (last two of whom were undoubtedly infected on admission), all four of which might well be considered as unavoidable deaths. The remaining fifteen are classified as station mortality and represent 1.9 per cent of all admissions during 1931-1933.

I had a chemist working for four and one-half months on the study of our oxygen chamber. We tested the chamber using very small premature infants, larger premature infants, full-term babies, and babies up to six months of age. We treated babies with pneumonia and babies with other types of infection, so that we covered the field of infants up to six months of age pretty carefully in our preliminary study before we introduced the oxygen chamber into our wards.

The chamber which we use is nothing more than the water-jacketed, electrically heated bed which we have been using for the last eighteen years equipped with the new oxygen unit which fits on it as a lid. Ordinarily we use two liters per minute. Our oxygen costs us a little less than $2.50 for a large tank. We use the commercial oxygen, and it costs us about $1.25 per day to run our chamber.

In no case did we find a higher accumulation than approximately 1 per cent of carbon dioxide in the chamber, and that, of course, with the larger infants and with those who had a high temperature. Our greatest trouble has been with large babies with high temperature in keeping down the humidity. For that purpose, we use with the oxygen unit an ice chamber which is part of the equipment which comes with the oxygen unit. According to the size of the baby and the amount of fever which he has, it must be refilled with cracked ice every two or three hours. In the presence of a high temperature in a large infant (a six-month-old baby is about the largest you can put in these), we have to add some salt at times to our ice to accelerate melting.

The newer beds are also equipped with little faucets so that you can hook rubber tubing to your ordinary running water in the ward and cool the bed with running water instead of ice.

We believe we have resuscitated a fair percentage of babies who otherwise might not have lived, and we do believe our pneumonia statistics are very much better. It is a comparatively inexpensive way of administering oxygen.

DR. C. O. TERRELL (FORT WORTH, TEXAS).—What was the time after birth you began feeding those children?

CHAIRMAN HESS.—The earliest we feed any baby is the second twelve hours. During the second twelve hours in the average infant we start off with six feedings, four of water and two of breast milk, from 2 to as much as 15 c.c., the amount varying with the size of the baby and its reaction to the feeding. The second day we feed regularly; our babies are fed every two hours.

I want to emphasize a point Dr. Dunham brought out in her chart, that we keep track of the total fluids. We think the amount of water the infants get should be as carefully noted on the chart as the amount of food they get.

I also want to emphasize the fact that if you want to run a station successfully you must have at least one person who knows the job and who is on it all the time. That is the secret of what success we may have had.

DR. DUNHAM.—May I ask if you would tell us why you use oxygen rather than a combination of CO_2 and O_2?

CHAIRMAN HESS.—Miss Woodward who did my chemistry while testing the oxygen unit used the CO_2 oxygen in her work. We believe we can accomplish everything claimed for CO_2 oxygen with oxygen alone. I personally haven't seen any advantage otherwise in the use of CO_2.

DR. DUNHAM.—There are, no doubt, indications for using oxygen alone or for using CO_2 and O_2 combined. I think there is great lack of any evidence, however, as to what the indications are since studies of the infant's blood seem not to have been made.

CHAIRMAN HESS (Slide).—Here are four babies who were in our station at one time last summer; admission weight, 865 gm.; birth weight, 825 gm.; admission weight, 790 gm.; admission weight, 890 gm. These pictures were taken when they were fifty-four, twenty-four, one hundred twelve, and seventy-four days old. Three of these babies are alive and doing well today. The fourth contracted pneumonia several weeks after graduation and died in another hospital.

DR. TERRELL.—In these very small children, do you find it necessary to give peritoneal fluid to get the amount of fluid intake you desire?

CHAIRMAN HESS.—We give normal saline or Ringer's solution, preferably the latter, subcutaneously in a very considerable number of our babies, especially those difficult to feed because of a respiratory or cardiac difficulty. It is often necessary to take our babies off their feedings because of cyanosis. We put nothing in the peritoneal cavity but blood, and that infrequently.

Another type of case, which may help to answer your question, in which we starve and use larger amounts of fluid are those with diarrhea, not necessarily serious cases of diarrhea. We starve our babies with diarrhea the minute they show anything that might be classified as a true diarrheal state, starving them for at least twenty-four hours and as long as thirty-six. In such cases you must use fluids subcutaneously.

We used to have a lot of cases of suppurative otitis and a considerable number of cases of mastoiditis in the earlier years, but mastoiditis cases in the last four years have been unknown to us, and we have very few cases of suppurative otitis. That is probably in large part due to the improvement of the ward technic and possibly to the fact that when our nurses have sore throats or rhinitis we make them stay out of the wards; also we do not open ears, except most infrequently, when it is done by an otologist or the resident on the service. We have also reduced spinal punctures to a minimum.

Since we have stopped most operative procedures on these babies, we have had fewer complications. We are inclined to overdo working with these babies. Artificial respiration is a very exceptional thing since we introduced oxygen. I think one of the greatest dangers is overmanipulation in all its forms. We have discarded the Drinker apparatus as impractical for premature infants.

DR. A. B. GROSSMAN (CLEVELAND, OHIO).—I should like to ask Dr. Clifford what method of induction of labor they have found to be most successful. I am particularly interested to hear that your results from cesarean operation have not been very satisfactory. I should like to know what other method you find to be better.

DR. CLIFFORD.—An obstetrician told me two years ago that there were three things they needed in obstetrics: One was a method of eliminating the pain in labor; one was a method of knowing the size of the baby prior to birth; and a third was the method for the induction of labor.

Although I can't speak as an obstetrician, the usual routine in our hospital is to try castor oil first; if that doesn't succeed, the membranes are ruptured; and if that doesn't succeed, a bag is introduced.

CHAIRMAN HESS.—Dr. Clifford, have you had any experience with the carbon-dioxide oxygen?

DR. CLIFFORD.—We think it is best to give carbon dioxide and oxygen when a respiratory stimulant is needed. In the cyanotic baby certainly there is no lack of carbon dioxide, and oxygen alone is all that is needed.

Will you state specifically what you and Dr. Wagner have already implied concerning the mental progress of premature infants? Do you feel, provided that the premature baby is not delivered to your nursery with an intracranial hemorrhage, that it has as good a mental outlook as any other normal baby?

CHAIRMAN HESS.—With a few exceptions, where something else might enter in, such as congenital heart disease or some other condition that might interfere with the progress of that child. Potentially, they are normal infants.

DR. WAGNER.—Or congenital brain defects.

DR. CLIFFORD.—We would rather see a baby with intracranial hemorrhage die than live and be mentally deficient. We should concentrate on trying to reduce the number of intracranial hemorrhages we see in the newborn babies.

I think it may be of interest, in light of what Dr. Wagner has brought out, to have on record the statistics Dr. Thomas Goethals has compiled for breech deliveries at the Lying-In Hospital. He has reviewed 1,000 breech deliveries, and in the last three years he has taken a personal assignment of all breech deliveries. Among other things, he has compared the statistics, corrected so that they are comparable, of the Lying-In Hospital and various other obstetrical hospitals all over the country. When the statistics are so corrected, the breech mortality is just about the same whether the deliveries are made in Philadelphia, Boston, or Chicago.

When he took his cases and classified them according to the infant's birth weight, he found the premature infant, comprising only one-fifth of his total series, contributed one-half of his breech mortality. It is fair to assume that the vast majority of the pathologic findings in those premature breech deliveries were intracranial hemorrhages.

Therefore, when a premature baby presents by the breech, either a manual external version and delivery by vertex or even a cesarean section may be indicated because of the danger of intracranial hemorrhages and later mental deficiency should the child survive.

CHAIRMAN HESS.—Our figures show a trend in the same direction, our twenty-six breech deliveries with a mortality of six. I don't know how many didn't live long enough to get to our station.

DR. CLIFFORD.—It certainly is evident that the interest of both pediatricians and obstetricians all over the country is being concentrated on this particular subject, and I think it is going to be reflected in our national statistics before very long.

CHAIRMAN HESS.—Dr. McKitterick has had experience with at least one premature that I know about, and I wonder if he has any ideas he would like to tell us about. Do you remember what that baby weighed?

DR. J. C. McKITTERICK (BURLINGTON, IOWA).—Two pounds, three ounces. Aside from the fact that she is very superior mentally, she requires during the winter almost constant administration of liver and iron. Apparently she never has developed her hematopoietic functions to the point they should be. She is now about nine years old.

DR. R. M. KEMPTON (SAGINAW, MICH.).—I would like to ask what the feeling is with regard to the use of pituitrin in obstetric procedure.

DR. CLIFFORD.—It is a very powerful agent and has to be used in skilled hands. Passed out indiscriminately, it is a very dangerous therapeutic procedure. Under control it is of very great value in speeding delivery. The premature infant is exposed to two hazards during delivery: trauma, which we have concentrated on; and the other, an even greater hazard, intrauterine asphyxia. If the placenta begins to separate or if the baby has his oxygen supply cut off in utero by any other means and suffers intrauterine asphyxia, he attempts to breathe in utero, fills his lungs with amniotic fluid and usually either is stillborn or dies very shortly after birth.

CHAIRMAN HESS.—There is one thing worth emphasizing from the obstetric standpoint. We believe that allowing the cord to pulsate for at least two or three minutes after birth, if the baby can be properly protected, is of very great value to the baby.

DR. CLIFFORD.—That is a point that is very difficult to settle; some hospitals routinely insist that the cord stop pulsating before it is cut. It has been the routine in our hospital to clamp it off as soon as the baby is delivered. It has been suggested that the reason the babies in cesarean section do so poorly, is that the cord is not allowed to stop pulsating and to empty its volume of placental blood into the fetus. All that has to be investigated. Certainly, some obstetric writers have explained the apparent discrepancy in the data on the blood of the newborn on that basis. That is, if you do not clamp the cord and wait until it stops pulsating, you may get a polycythemia and quite severe icterus neonatorum in the course of the first two or three days. If you clamp the cord immediately, the blood count at birth will be approximately four million, no polycythemia, and you will encounter a very low incidence of icterus neonatorum. There is supposed to be an 80 per cent reduction in the incidence of severe icterus neonatorum when the cord is not allowed to stop pulsating.

DR. KEMPTON.—Is alphalobelin a good product?

CHAIRMAN HESS.—We did some experimental work with it, and then also had occasion to use it over a period of something like six months, six or seven years ago when it first came into general use. We are very much afraid of it.

DR. CLIFFORD.—Resuscitation in the newborn is a problem of greater importance today than it was a number of years ago.

Dr. Frederic C. Irving in a very extensive survey took five hundred district deliveries and investigated the records of resuscitation. He found that 90 per cent of the babies cried the minute they were born. The only anesthesia the mothers had received was "bulgarian" and a few kind words. They had their labor without the help of any drugs whatsoever. When he investigated the so-called twilight sleep series, when morphine and scopolamine were used, he found that 60 per cent of the babies had to be resuscitated as opposed to 10 per cent in the first mentioned series. With the present analgesia that is being used, which is pentobarbital or nembutal with or without scopolamine, 40 per cent of the babies had to be resuscitated. The obstetricians expect it and take that into consideration as the price paid for analgesia.

This change in obstetric practice has changed the pathology of diseases of the newborn. When the mother was conscious of her labor and was becoming exhausted, when the obstetrician was conscious of the mother's suffering, and when labor was long and drawn out, there was a tendency to shorten the last stage of labor and deliver instrumentally with its resultant increase in intracranial hemorrhage. Now, with the mother completely free from pain and out of the picture, the cervix can be allowed to dilate to its full extent and labor take its normal course. The incidence of midforceps and high forceps deliveries in our hospital has been reduced to practically zero since the advent of successful analgesia. The incidence of intracranial hemorrhage is now so low we have difficulty in finding a case to show the students. Thus, the change in obstetric practice has eliminated intracranial hemorrhage to a large measure, but it has substituted asphyxia and the problem of resuscitation. The mortality and morbidity are lower under the present routine and therefore it is a fair exchange.

DR. GROSSMAN.—Does avertin have any effect on the child?

DR. CLIFFORD.—It stops labor immediately.

DR. KEMPTON.—Have you seen any difficulty with sodium amytal?

DR. CLIFFORD.—You may not have heard of the research Dr. Irving has conducted on these various analgesics. He took 100 patients in each series. To the first he gave pentobarbital and scopolamine; to the next he gave sodium amytal alone or in combination with something else; to the next, avertin; and so forth. He found that sodium amytal was good, but that pentobarbital with or without scopolamine and rectal ether was better. There were less failures as far as analgesia was concerned, there was less excitement on the part of the mothers, and the babies showed less need for resuscitation.

REPORT OF THE COMMITTEE ON HOSPITALS AND DISPENSARIES

Social Service: Supplementary Report: General Summary

Dr. Clifford G. Grulee, Chairman; Dr. Murray H. Bass; Dr. L. R. DeBuys; Dr. Roger H. Dennett; Dr. Henry Dietrich; Dr. Lewis Webb Hill; Dr. George F. Munns.

SOCIAL SERVICE

THIS report includes not only the original thirty-five hospitals but also three which are included in a supplementary report.

Of the thirty-eight hospitals, thirty-five have social service departments (Table I). One has no social service department; one carries on social service work, but not as a separate department; one failed to reply. Among those in charge of social service work, only seven indicate that they have had definite social service training. This department is conducted in sixteen instances by nurses, in one instance by a physician, and in seven instances by individuals having college degrees. In five instances no reply to "qualifications" was given. It is surprising that only one-fourth of the replies indicate that those in charge of the social service work have had special training. Physicians and nurses are no more qualified for the direction of social service work, unless they have had special training, than social service workers are qualified for nursing or medicine.

In each of the thirty-five hospitals the social service worker is a full-time worker. The number of social service workers in the respective departments varies from one to fourteen; the usual number being from two to four. In only four instances are these part-time workers.

Sixteen hospitals investigate all patients who come to the hospital; two investigate all except private cases; two investigate only free and part-pay patients. Thus, twenty hospitals investigate practically all their patients since the number of private patients is so few as to be negligible in most of these hospitals.

In thirty-one of the hospitals interviews with parents are held; eight investigate the homes in all cases; and twenty-four, in special cases. One even provides monthly home visits. In ten instances the hospital social service investigates the ability of the patients to pay, while twelve make no such investigation. Two investigate by special social service workers; three, by the admitting officer; one, by the judge of the county; and three, on free cases only.

As to case history taking, nineteen take a social history in all cases; twelve file this social history with the medical history; two file part of it; two, a summary; and one, by request. Eighteen file their social histories with the bedside notes, and in twenty-two hospitals and abstract is filed with the history of the case.

Concerning convalescent care (Table II), the social service arranges for this care in twenty-six hospitals; among others, only in some cases; and in five, not at all. Twenty-nine hospitals have convalescent institutions available; in one a small charge is made. Twenty-six have foster homes; one, for pay patients only. In twelve

TABLE I

HOSP.	S. S.	WORKER IN CHARGE		WORKERS		PATIENTS INVESTIGATED				SOCIAL HISTORY			
		QUALIFICATIONS	FULL TIME	NUMBER	FULL TIME	ALL	HOSP. INTERVIEW WITH PARENT	HOME INVESTIGATED	ABILITY TO PAY	TAKEN ON ALL	FILED WITH MEDICAL HISTORY	ABST. WITH BEDSIDE NOTES	FILED WITH HISTORY
1	Yes	G.N.	Yes	4	Yes	Yes	Yes	S. C.	No	No	No	No	No
2	Yes	R.N.	Yes	3	Yes	Yes	Yes	Yes	Yes	Yes	No	H. req.	--
3	Yes	A.B.	Yes	2	Yes	F. & P. P.	Yes	S. C.	Yes	Some	No	Yes	Yes
4	Yes	M.A.	Yes	4	Yes	No	Yes	S. C.	Spec. S. S.	Yes	No	Yes	Yes
5	Yes	G.S.S.	Yes	1	Yes	No	Yes	S. C.	No	Yes	Yes	Yes	Yes
6	Yes	G.N.	Yes	7	Yes	ex. P. C.	Yes	S. C.		Yes	No	Yes	Yes
7	Yes	--	Yes	3	Yes	--	Yes	S. C.	Spec. S. S.	No	Yes	Yes	--
8	Yes	T.S.S.	Yes	2-3	Yes	No	Yes	S. C.	No	No	No	No	No
9	Yes	--	Yes	3	Yes	No	Yes	S. C.	Co. judge	No	No	Yes	Yes
10													
11	No												
12	Yes		Yes	10	Yes	No	Yes	S. C.	Admit. officer	No	Yes		
13	Yes	A.B.	Yes	2	No	Yes	Yes	Yes	Free only	Yes	Yes	Yes	Yes
14	Yes	G.S.S.	Yes	5	Yes	No	Yes	S. C.	No	No	Sum.	Yes	Yes
15	Yes	G.N.	Yes	8	Yes	Yes	Yes	S. C.	----	Yes	No	Yes	Yes
16	Yes		Yes	12	Yes	No	Some	No	No	No	By req.	No	By req.
17	Yes	R.N.	Yes	0	--	No	--	--	Free only	No	--	--	--
18	Yes	M.A.	Yes	9	No	No	Some	S. C.	Yes	No	No	Yes	Yes
19	Yes	R.N.	Yes	2	Yes	No	Yes	S. C.	No	Yes	No	No	No

TABLE I—CONT'D

HOSP.	S. S.	WORKER IN CHARGE		WORKERS		PATIENTS INVESTIGATED				SOCIAL HISTORY			
		QUALIFICATIONS	FULL TIME	NUMBER	FULL TIME	ALL	HOSP. INTERVIEW WITH PARENT	HOME INVESTIGATED	ABILITY TO PAY	TAKEN ON ALL	FILED WITH MEDICAL HISTORY	ABST. WITH BEDSIDE NOTES	FILED WITH HISTORY
20	Yes	G.N.	Yes	2	Yes	Yes	Yes	S. C.	No	Yes	Yes	Yes	Yes
21	Yes	G.S.S.*	Yes	3	Yes	Yes	Yes	Yes	No	Yes	No	No	No
22	Yes	G.N.	Yes	--	Yes	Yes	Yes	Yes	No	Yes	Part	Yes	Yes
23	No†			4		Yes	Yes	S. C.	S. C.	Yes	Yes	No	--
24	Yes	R.N.	Yes	3	Yes	Yes	Yes	S. C.	Free only	Yes	Yes	--	Yes
25	Yes	A.B.	Yes	4	No	Yes	Yes	S. C.	Yes	Yes	No	Yes	Yes
26	Yes	G.S.S.	Yes	2	Yes	Yes	Yes	S. C.	S. C.	No	Yes	Yes	Yes
27	Yes	B.S.	Yes	2	Yes	No	Yes	S. C.	Admit. officer	No	No	Yes	Yes
28	Yes	R.N.	Yes	2	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
29	Yes	M.D.	Yes	14	Yes	No	Yes	S. C.	Admit. officer	Yes	No	H. rep.	Yes
30	Yes	A.B.	Yes	1	Yes	F. & P. P.	Yes	S. C.	Yes	Yes	No	No	Yes
31	Yes	R.N.	Yes	2	Yes	ex. P. C.	Yes	Yes	Yes	ex. P. C.	Part	Part	Yes
32	Yes	R.N.	Yes	8	Yes	Yes	Yes	S. C.	Yes	No	Yes	No	No
33	Yes	R.N.	Yes	3	Yes	No	--	--	No	No	--	--	--
34	Yes	R.N.	Yes	5	Yes	--	--	--	No	below	2 years		
35	Yes	R.N.	Yes	1	--	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
36	Yes	R.N.	Yes	4	No	No	Yes	S. C.	No	No	Sum.	Yes	Yes
37	Yes	T.S.S.	Yes	2	Yes	Yes	Yes	S. C.	Yes	Yes	N. psy.	No	--
38	Yes	G.S.S.	Yes	5	--	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

*For unmarried mothers and babies.

†Not a separate department.

Abbreviations used. *A. sup.*, assistant superintendent; *B. mgrs.*, board of managers; *By req.*, by request; *C. H. N.*, city health nurse; *D. S. S.*, director of social service; *ex. P. C.*, except private cases; *Facil. adeq.*, facilities adequate; *F. & P. P.* free and part pay; *Fin.*, financial; *G. S. S.*, graduate social service worker; *H. rep.*, home report; *if nec.*, if necessary; *Lim.*, limited; *M. H.*, medical history; *N. psy.*, neuropsychiatry; *Occa.*, occasionally; *Reg. w.*, Regular worker; *S. C.*, special cases; *Spec. S. S.*, Special social service worker; *Sum.*, summary; *Sup.*, Superintendent; *T. S. S.*, trained social service worker.

instances arrangements for convalescent care are adequate, while in twenty-one they are not; and one answered "fair." Concerning the follow-up of cases, twenty-six follow up all cases, while nine follow up cases as indicated by the need or desire to do so. In thirty-six instances, the social service workers assist in returning the patients for further hospitalization if that is necessary.

TABLE II

HOSP.	CONVALESCENT CARE BY S. S.						FOLLOW UP	RECALL	VOLUNTEERS			
	ARRANGE	CONV. INST.		FOSTER HOMES		FACIL. ADEQ.			INDOOR		OUTDOOR	
		AVAIL	USE	AVAIL	USE					NO.		NO.
1	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	No	--	Yes	1
2	Yes	Lim.	Yes	Pay patients		No	Yes	Yes	Yes	4	Yes	2
3	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	5	No	--
4	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	30	Yes	2
5	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	No	--	No	--
6	Yes	Lim.	Yes	Lim.	Yes	No	Yes	Yes	Yes	85	Yes	6
7	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	4-5	No	--
8	Yes	Yes	Yes	Lim.	Yes	No	Some	Yes	Yes	--	No	--
9	Yes	Yes	Yes	Yes	Yes	Yes	Some	Yes	Yes	1	--	--
10												
11		Yes										
12	Yes	Yes	Yes	No	--	No	Yes	Yes	Yes	7	Yes	3
13	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	No	--	No	--
14	Yes	Yes	Yes	Yes	Yes	Yes*	Yes	Yes	Yes	2	Yes	2
15	No	Yes	Yes	No	--	Yes	Yes	Yes	Yes	1	Yes	--
16	Yes	Lim.	Yes	Some	Yes	No	Yes	Yes	Yes	--	Yes	--
17	No	No	--	No	--	None	Yes	Yes	No	--	No	--
18	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	5	Yes	5
19	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	--	No	--
20	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	3	Yes	5
21	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	3	Yes	3
22	Yes	Yes	Yes	No	--	Yes	Yes	Yes	No	--	No	--
23	Yes	Yes	Yes	No	--	Fair	S. C.	Yes	Yes	1	Yes	1
24	No							Yes	No	--	No	--
25	Some	No	--	Yes	Some	No	Some	Yes	Yes	3	Yes	1
26	Yes	Yes	Yes	Lim.	Occa.	Yes	Yes	Yes	Yes	3	No	--
27	By req.	Yes	Yes	Yes	Some	No	Yes	Yes	Yes	1	No	--
28	No	Yes	Yes	Yes	Yes	No	Some	Yes	Yes	20	Yes	12
29	Yes	Some	Yes	Some	Some	No	Yes	Yes	Yes	56	Yes	12
30	Yes	Yes	Yes	Yes	Yes	No	If nec.	Yes	Yes	15	No	--
31	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	--	Yes	30
32	Some	Yes	Yes	Yes	Yes	Yes	Some	Yes	Yes	26	Yes	10
33	Yes	Yes	Yes	No	--	Yes	Yes	Yes	No	--	Yes	2-3
34	By req.	--	--	--	--	Yes	Yes	Yes	Yes	2-3	Yes	--
35	No	No	--	Yes	Yes	No	Yes	Yes	No	--	--	--
36	Yes	No	--	Yes	Yes	No	By req.	Yes	Yes		Yes	
37	Some	Some chg.		No	--	No	If nec.	Yes	Yes	1	Yes	3
38	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	No	--	--	--

*Except diabetic and cardiac.

Twenty-five departments use volunteers indoors, and eleven do not. The number of workers varies from one to eighty-five, the usual number being four. Twenty-one employ volunteers outdoors, and twelve do not. The number varies from one to thirty, the usual number being three.

In twenty-five instances the social service is supported by hospital funds (Table III); in five, by outside funds; and in five, partly by the hospital and partly by outside funds. Twenty-two have a lay committee in charge of social service; ten have a physician on this committee. In twenty-two instances, the social service is represented on the board of managers.

Thirty-four of the thirty-eight hospitals have social service workers in the dispensary (Table IV); the number varies from one to twenty, the usual number being two. In only six hospitals are the workers for the dispensary only. In eighteen instances all new cases are seen by social service workers; in nine those selected by the physician and in six only special cases. Nineteen take a social history on all patients; fourteen send all such histories taken to the physician; in two instances this is done by request only, and in one instance only a summary is sent. In fourteen instances only the important case histories are sent to the physician;

TABLE III

HOSP.	S. S. SUPPORT		COMMITTEE IN CHARGE		
	HOSP. FUNDS	OUTSIDE FUNDS		PHY. ON	REP. ON B. MGRS.
1	Yes	No	Yes	No	Yes
2	Yes	No	Yes	3	Yes
3	Yes	--	Yes	No	Yes
4	No	Yes	Yes	No	Yes
5	Part	Part	No	--	--
6	No	Yes	Yes	No	Yes
7	Yes	--	Yes	Yes	Yes
8	Yes	No	Yes	1	Yes
9	Yes	No		Hosp. officers	
10					
11					
12	Part	Part	No	--	--
13	Yes	No	No	--	--
14	Yes	--	Yes	Yes	Yes
15	Yes	--	Yes		Yes
16	Part	Part	No	No	No
17	Yes	--	No	--	--
18	No	Yes	Yes	Yes	Yes
19	Part	Part	Yes	1	Yes
20	Part	Part	Yes	No	Yes
21	Yes	--	Yes	1	Yes
22	No	Yes	Yes	No	Yes
23	--	Yes	No	--	--
24	Yes	No	No	No	No
25	Yes	No	No	--	--
26	Yes	No	Yes	1	Yes
27	Yes	No	Yes	2	Yes
28	Yes	No	No	--	--
29	Yes	No	Yes	Yes	Yes
30	Yes	--	Yes	No	Yes
31	Yes	No	Yes	No	Yes
32	Yes	No	Yes	No	Yes
33	Yes	No	No	No	No
34	No	Yes	No	--	--
35	Yes	No	Yes	No	Yes
36	Yes	No	No	No	No
37	Yes	No	No	--	--
38	Yes	--	Yes	No	Yes

four give verbal reports, and two give verbal reports if requested. Eighteen file the social history with the clinical record; one files a summary, and one files part of a history. Twenty-three keep a separate file for social histories, and twenty-seven keep these histories in a permanent file.

Twenty-nine departments make home visits; two, occasionally; and in one instance the city health nurse makes the home visits. In twenty-nine instances these home visits are made to check conditions, and in two cases they are occasional. Twelve make calls to check ability to pay; two occasionally and one on free cases only.

TABLE IV

HOSP.	S. S.	WORKERS		NEW CASES		SOCIAL HISTORY							S. S. HOME VISITS		
							SENT TO PHYSICIAN			FILED					
		NUMBER	DISP. ONLY	ALL SEEN BY S. S.	HOW SELECTED	TAKEN	ALL	VERY IMP.	VERBAL REPORT	WITH CLINIC RECORD	SEPARATE FILE	PERMANENT FILE	MADE	CHECK CONDITIONS	CHECK ABILITY TO PAY
1	Yes	4	No	No	Phy.	Fin.	No	No	By req.	No	Yes	Yes	Yes	Yes	No
2	Yes	4	Yes	Yes	--	Yes	No	Yes	--	No	Yes	Yes	Yes	Yes	Yes
3															
4	Yes	3	No	No	S. C.	No	No	Yes	Yes	No	Yes	Yes	Yes	Yes	No
5	Yes	2	No	No	Phy.	No	Yes	--	--	Yes	No	--	Yes	Yes	No
6	Yes	7	No	Yes	--	Yes	No	No	Yes	No	Yes	Yes	Yes	Yes	Occa.
7	Yes	2	No	No	S. C.	No	Yes	--	--	Yes	Yes	Yes	Yes	Yes	No
8															
9	Yes	2	No	No	Phy.	No	Yes	--	--	Yes	Yes	Yes	Occa.	Yes	No
10	Yes	1	No	Yes	--	No	No	Yes	No	No	Yes	Yes	Occa.	Occa.	No
11															
12	Yes	10	No	No	S. C.	Yes	Yes	--	--	Yes	No	--	Yes	Yes	No
13	Yes	13	No	Yes		No	No	Yes	No	No	Yes	Yes	Yes	Yes	No
14	Yes	3	Yes	No	Phy.	No	No	--	Yes	No	Yes	Yes	Yes	Yes	No
15	Yes	6	No	No	S. C.	Yes	No	Yes	No	Yes	Yes	Yes	Yes	Some	No
16	Yes	1	Yes	No	--	No	By req.	--	--	No	Yes	Yes	No	No	--
17	Yes	1	No	No	Phy.	No	No	Yes	No	Yes	No	No	Yes	Yes	Yes
18	Yes	20	No	Yes	--	Yes	No	Yes	By req.	No	Yes	Yes	Yes	Yes	Occa.
19	Yes	6	No	Yes	S. C.	No	By req.	Yes	No	No	Yes	Yes	Yes	Yes	Yes

TABLE IV—CONT'D

HOSP.	S. S.	WORKERS		NEW CASES		SOCIAL HISTORY							S. S. HOME VISITS		
							SENT TO PHYSICIAN			FILED					
		NUMBER	DISP. ONLY	ALL SEEN BY S. S.	HOW SELECTED	TAKEN	ALL	VERY IMP.	VERBAL REPORT	WITH CLINIC RECORD	SEPARATE FILE	PERMANENT FILE	MADE	CHECK CONDITIONS	CHECK ABILITY TO PAY
20	Yes	1	No	No	Phy.	Yes	Yes	--	No	Yes	No	--	Yes	Yes	No
21	Yes	--	--	Yes	--	Yes	--	--	--	Yes	Yes	Yes	Yes	--	Free
22	Yes	--	--	Yes	--	Yes	Yes	--	No	Part	--	Yes	Yes	Yes	--
23	Yes	2	No	Yes	--	Yes	Yes	--	--	No	Yes	Yes	Yes	Yes	Yes
24															
25	Yes	5	No	Yes	--	Yes	Yes	--	No	Yes	No	Yes	Yes	Yes	Yes
26	Yes	2	No	No	Phy.	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes	No
27	Yes	2-3	No	Yes	--	Yes	No	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes
28	Yes	2	No	Yes	--	Yes	No	Yes	No	Yes	No	Yes	Yes	Yes	Yes
29	Yes	2	Yes	Yes	--	No	No	Yes	No	No	Yes	Yes	Yes	Yes	Yes
30	Yes	2	Yes	Yes	--	Yes	No	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
31	Yes	2	No	Yes	--	Yes	Yes	--	--	Yes	Yes	Yes	Yes	Yes	Yes
32	Yes	8	No	Yes	--	No	Yes	--	--	Yes	--	--	Yes	Yes	No
33	Yes	3	No	No	S. C.	No	No	Yes	No	Yes	No	Yes	Yes	Yes	No
34	Yes	5	No	No	Phy.	No	Yes	--	--	Yes	No	--	C. H. N.	Yes	No
35	Yes	1	No	Yes	--	Yes	Yes	--	--	Yes	No	--	Yes	Yes	Yes
36	Yes	3	No	No	Phy.	Yes	Sum.	--	--	Sum.	Yes	Yes	Yes	Yes	No
37	Yes	2	Yes	Yes	--	Yes	No	Yes	--	No	Yes	Yes	No	No	No
38	Yes	6	No	No		Yes	Yes	--	--	Yes	Yes	Yes	Yes	Yes	Yes

Twenty-seven use volunteers in the social service (Table V); the number varies from one to ninety-one; eighteen have twenty or less and these work from one-half to six days per week for the fifteen dispensaries which reported. Only five have irregular attendance. In twenty-four instances these workers are trained as follows: seventeen, by the director of social service; two, by the head nurse; two, by a regular worker; one, by the superintendent; and one, by the assistant superintendent. In one instance no training is given. In twenty-three instances, these volunteers are said to be satisfactory. In the one case in which they are said to be not satisfactory, they are not trained. In one instance the work is said to be fair, and in one, the volunteers have been introduced too recently for a report to be made. The work of the volunteers is as follows: In nine dispensaries they assist the doctors and nurses; in sixteen they do clerical work of typing and filing; in seven they do follow-up work, and in ten they take histories on the patients. In seven they form the motor corps; in four they help with the occupational therapy, and in fourteen they do reception room work. In four they work in the record room; one runs errands; in eleven they do secretarial work; one does social case work, and in three they take care of supplies.

Summary

If there is one place where social service work would seem to be necessary, it is in a children's hospital; it is interesting to note how generally the children's hospitals in this country and Canada are aware of the fact. It is peculiar, however, that they have not considered it necessary to employ persons specially trained in social service work in so many instances. Only 20 per cent of them have such service. However, the social service worker is, practically in all instances, a full-time worker. We find it impossible to judge whether the number is adequate from the figures given.

The extent of investigation of patients by the social service seems to vary somewhat with respective local conditions, but generally the situation seems to be ably handled. In comparatively few, however, is the ability of the patients to pay determined by the social service worker.

There is considerable variation in types of social histories and in the disposition of these. On the whole, there seems to be adequate cooperation with the medical staff with respect to the social histories in these hospitals.

It is surprising that such a large number of hospitals have convalescent care for their children, but it is not surprising that in most instances the available beds are inadequate. Only in recent years has convalescent care of hospital patients begun to receive the amount of attention which it deserves, perhaps partially because of the fact that it is so much cheaper to care for a convalescent in a convalescent home than in a hospital. Foster homes are used in many instances, and here too the service is inadequate to meet the need. The follow-up of these cases is quite satisfactory, and in every instance the social service is used for recall of patients to the hospital.

Volunteers are employed in practically all of the hospitals. They are employed both indoors and out and are assigned to various duties, such as maintenance of libraries, occupational therapy assistance, assistance in recording and caring for histories and records, transportation for patients, etc. The support of the social service is in most instances by the hospital itself though in some instances it is carried on by outside agencies. It is a surprising fact that in only ten instances is there a physician on the board in charge of social service. This would seem to be a strange oversight on the part of those in charge of social service and should be corrected.

TABLE V

HOSP.	VOLUNTEERS						WORK											
	USED	NUMBER	DAYS PER WEEK	IRREGULAR ATTENDANCE	TRAINED BY	SATISFACTORY	ASSIST.	CLERICAL	FOLLOW UP	HISTORIES	MOTOR CORPS	OCCUPATIONAL THERAPY	RECEPTION	RECORD ROOM	RUN ERRANDS	SECRETARIAL	SOCIAL CASE WORK	SUPPLIES
1	Yes	40	6	No	D. S. S.	Yes				*			*			*		
2	Yes	4	1-2	No	H. N.	Yes										*		
3																		
4	Yes	28	--	No	D. S. S.	Yes					*	*		*		*	*	
5	No																	
6	Yes	91	--	--	D. S. S.	Yes					*							
7	Yes	12	2	Yes	D. S. S.	Yes		*										
8																		
9	No																	
10	No																	
11																		
12	Yes	10	6	No	D. S. S.	Fair		*	*			*						
13	Yes	52	--	No	D. S. S.	Yes	*	*	*	*			*			*		
14	Yes	7	6	No	H. N.	Yes	*						*		*	*		
15	Yes	3		Yes	D. S. S.	Yes		*		*			*					
16	No																	
17	No																	
18	Yes	15-20	2	No	D. S. S.	Yes	*	*	*	*		*		*				
19	Yes	40	6	No	D. S. S.	Yes	*	*	*				*					*
20	Yes	4	--	Yes	--	Yes			*									*
21																		
22	Yes	20																
23	Yes	2	3		Reg. W.	Yes		*	*	*			*					
24																		
25	Yes	3	1½		Reg. W.	Yes		*					*					
26	Yes	2	3	No	D. S. S.	Yes		*										
27	Yes	1		No	D. S. S.	Yes		*		*			*					
28	Yes	4		No	D. S. S.	Yes		*			*		*	*				
29	Yes	14	6	No		Yes		*					*			*		
30	Yes	6	2	Yes	D. S. S.	Yes	*	*		*						*		
31	Yes	3	½	No	D. S. S.	Yes				*	*		*					
32	Yes	36	--	--	D. S. S.	Yes	*	*	*	*			*			*		
33	Yes	10	--	Yes	No	No										*		
34	Yes	17	2	No	D. S. S.	Yes	*	*			*		*					*
35	No																	
36	Yes	50	--	--	A. sup.	Yes	*	*		*	*		*	*		*		
37	Yes	25	1	--	D. S. S.	?												
38	Yes	30	--	No	Sup.	Yes	*				*	*				*		

The social service in the dispensaries of these hospitals is carried on very much the same as it is in the hospital, both as to social histories and home visits. The volunteer work is quite extensive, but the type of work assigned to volunteers is most varied.

SUPPLEMENTARY REPORT

Three Hospitals Omitted in the Original Report

Three children's hospitals omitted in the original survey are considered in the following report. These hospitals are located in Oregon, Texas, and Pennsylvania. In the combined reports thirty-eight children's hospitals in this country and Canada are considered.

Professional Staff.—Patients in the wards are under the exclusive care of physicians appointed to the attending staff in each hospital.

Two hospitals have specialists on the attending staff in all specialties considered in the original report; one lacks an attending psychologist and a specialist in oral hygiene. In one instance the specialists visit at regular intervals; in the case of the other two they are often "on call" only. In one instance the medical director is employed full time; otherwise there are no full-time physicians on the attending staff, and none receive a salary except in one instance in which the pathologist, roentgenologist, and dentist are paid a salary. The attending staff has duties in the dispensary in each hospital.

House Staff.—Among the house staffs these hospitals report four, three, and one residents, respectively. Each one serves for one year and has definite dispensary duties. One hospital requires preliminary training of at least one year of pediatric interneship; two require only one year of rotating interneship. The salaries are respectively $100.00, $75.00, and $40.00 per month. Women are not eligible for the residency in one hospital. Only one employs an assistant resident. In this instance one year of preliminary general interneship is required. The length of the service is one year; women are eligible and the salary is $40.00 per month.

One hospital employs no internes but has four residents. The other two hospitals employ two and eleven internes, respectively. In both of these hospitals women are eligible. Salaries are $25.00 and $17.00 per month. Interneships are open to graduates of class A schools. The length of the service is one year in each, and in both hospitals the interne has duties in the dispensary.

Two of the hospitals are connected with a medical school; the third affords opportunity for study to postgraduate students. Clinics and ward rounds for students are held in each hospital. These are also open to practicing physicians. One hospital has a definite course of postgraduate instruction.

Clinical and pathologic conferences are held regularly in two hospitals; these occur once weekly. One institution has no pathologic conferences.

The two hospitals employing internes afford them special instruction in x-ray work and in the pathologic, bacteriologic, and serologic laboratories. This instruction is chiefly in diagnosis. There is no special instruction in physiotherapy except in one instance where it is available if the interne is especially interested. Neither hospital affords special instruction in diet and nutrition other than that available on any general medical service.

Medical libraries and facilities for research are available in each hospital.

One hospital does not have observation wards; instead, individual rooms are used for isolation in suspected contagion.

Routine blood counts, urinalyses, histories, physical examinations, vaginal smears, von Pirquet or Mantoux tests, and Wassermann and Kahn tests are performed before admission to the wards in one hospital, one omits the von Pirquet and Wassermann tests. Only one takes routine throat cultures for *B. diphtheria*. One hospital did not reply to this portion of the questionnaire.

Two hospitals send special cases such as pneumonia, acute upper respiratory infections, impetigo, erysipelas, etc., to the general wards but use the isolation room system if precaution is indicated by the particular case. One does not admit gonorrheal vaginitis; two do not admit gonorrheal ophthalmia. One hospital did not reply to this section of the questionnaire.

Superintendent's Section.—Each hospital is located in a residential district—one, in a quiet, good district; one, in a noisy, poor district; and one, in a moderate district. None of them have playground facilities in the grounds of the hospital.

The respective bed capacities are seventy-five, eighty-two, and seventy-five, including cribs and bassinets. The age limit for patients in two hospitals is fourteen years, and in one there is no age limit (probably refers to general hospital with which it is associated). Two have special wards for medical and surgical cases only; none have special neurologic wards; only one has special wards for otolaryngologic cases. None have special wards for contagious cases.

Some types of illness are excluded in each hospital. One excludes pulmonary tuberculosis, contagious diseases, and acute infectious venereal diseases. A second excludes tuberculosis, chronic mental cases, and contagious diseases unless the patient can afford a day and night nurse. The third excludes primary syphilis, gonorrhea and active tuberculosis, impetigo, scabies, and the contagious diseases. Only one maintains a ward for contagious diseases.

The total number of patients admitted to each hospital in 1932 were 2,228, 9,635, and 2,235, respectively. In the same order hospital deaths were 73, 280, and 111. All hospitals accept both colored and white children. They are segregated in one hospital. One hospital does not have private rooms for children; the other two have nine and eighteen, respectively.

One hospital derives 96 per cent of its funds from the state, the remainder from patients; one, from the state (33⅓ per cent), endowment, community chest, and patients; one does not reply. The cost per patient per day in the respective hospitals is $4.58, $4.82, and $3.50.

The superintendent is a physician in one hospital; a registered nurse, in the second; and a layman, in the third.

Nursing.—Only one hospital maintains its own complete nursing school; the course is for three years; and the average number of student nurses is 117. However, the other two hospitals afford instruction to affiliates from other schools. The section of the questionnaire concerning the number of duty nurses assigned to various wards and the length of their assignments and proportion of number of nurses to patients was not answered in two of the questionnaires. The third indicated that the proportion of nurses to patients is sufficient for efficient care.

Operating Room.—The operating rooms are in charge of experienced graduate nurses in each hospital. The number of operations in the last fiscal year was 1,691, 6,419, and 1,787, respectively.

Student nurses are given instruction in the preparation of infant foods in each hospital. The length of the assignments in the respective hospitals are five, fourteen, and thirty days. Two hospitals afford instruction in the preparation of children's diets, the length of the respective assignments in each course being five and fourteen days. Two hospitals afford all nurses practical experience in the social service department. This is two weeks' assignment in one and a month's assignment in the other institution.

Student nurses are not assigned to night duty in one hospital; the other two permit them to go on night duty during the latter part of the first year.

A graduate nurse is in charge of the wards during the day in each hospital. Student nurses serve in this capacity at night in two of the hospitals. Supervising nurses are also employed in each hospital, the number being five, ten, and one, respectively.

The total number of hours devoted to classroom, laboratory, and demonstration work is sixty hours for the three-month affiliate course in one hospital, 489 hours for the three-year affiliate course in the second, and 803 hours in the third hospital which maintains its own complete school. Although one hospital does not have its own complete nursing school, through cooperation with a university group a three-year course in pediatric nursing is available.

Postgraduate instruction in pediatric nursing probably is available in each hospital although none of them states that there is a definite course in that type of instruction.

None train nursery maids; none afford opportunity for training in an affiliated nursery school or kindergarten; and none use "ward helpers" on any wards.

Separate towels, thermometers, and wash cloths are provided for each infant and child in all hospitals except one which does not provide a separate thermometer for each older child. In all hospitals separate gowns are provided for handling each baby and used only for that baby when "deemed advisable" or in infected cases. Ordinary isolation technic is used in all hospitals to prevent cross-infection.

X-ray Facilities.—Each hospital has x-ray diagnostic facilities although in one instance the x-ray department of another hospital four blocks distant is used. Full-time technicians are employed in each department, and the facilities of the respective departments are available at any time during the day or night. All departments are equipped for high-speed, superficial and deep radiography, and all have a fluoroscope, are able to take stereoscopic plates, and have a portable machine.

Internes do x-ray work for one month as part of their regular training in one hospital; in another the work is optional; and in the third it is not available. Two hospitals consider that their x-ray equipment is adequate; the third, of course, has no equipment of its own. The hospital x-ray departments also serve the dispensary in two hospitals, and outside physicians, in one instance.

The number of x-ray plates taken during the last fiscal year were 1,070, 4,122, and 589, respectively. The number of deep and superficial treatments in one instance was eleven; in another 1,403, and in the third there was no reply.

Laboratory Facilities.—Each hospital has a director in charge of all laboratory work. In two instances he is a full-time director. In one instance he is available only four hours daily.

Pathologic Facilities.—Two have full-time directors of the pathologic laboratory. Three have full-time technicians for the pathologic laboratory. Internes do routine laboratory work in none of the hospitals.

Each hospital considers its facilities adequate for its needs. There are available facilities for research work in two hospitals. The number of autopsies performed as compared to deaths during the last fiscal year was respectively as follows: 50:73, 117:280, and 30(?):51.

Clinical Laboratory.—There are full-time directors in two hospitals and full-time technicians in three.

In no instance do internes perform routine laboratory work. Blood chemical determinations are done in all laboratories. Satisfactory "fume hoods" and colorim-

eters are available in each laboratory, and each has satisfactory equipment for basal metabolism tests. Each laboratory reports that it considers its equipment adequate; all have facilities for research work.

Bacteriologic Laboratory.—Only one hospital has a full-time director; all have full-time technicians. The internes in no instance do routine bacteriologic work. All have electric incubators; two make their own media; and one buys them from a supply house.

Two laboratories keep animals for experimental work. All consider that their laboratory facilities are adequate for their needs; two have facilities for research work.

Serologic Laboratory.—There is a full-time director in only one instance. All have full-time technicians. In no instances do internes perform routine laboratory work. Wassermann and Kahn tests are made in each laboratory. All laboratories consider their equipment adequate for their needs, and two provide facilities for research work.

Laboratory (Miscellaneous).—Two have facilities for simple photography, and one, for color photography. One has facilities for motion picture photography. An electrocardiograph is available in each hospital.

Physiotherapy.—All hospitals have facilities for physiotherapy, and in each the department is separate. There is a full-time director in one department and a full-time technician in another. No department has both a full-time director and a technician.

All departments have facilities for dry heat, moist heat, massage, ultraviolet light, diathermy, and electricity; in each instance they may be used at the bedside.

Diet Kitchen.—All have graduate dietitians in charge of the department. The dietitian has entire charge of the menus in two hospitals, but only the special diets in one.

"Standard special diets" are prepared by cooperation of the dietitian and the medical personnel in all hospitals.

Social Service.—This is included in the special report along with that of thirty-five children's hospitals covered in previous reports.

Occupational Therapy.—This activity is lacking or poorly developed in all hospitals.

Education.—Schooling is provided for children by a public school teacher in one hospital. In the second this work is done only by volunteer workers and in the third is available only to cardiac patients and is carried on by a university student teacher.

Provision is made for the play activities of convalescents in only one hospital, and in that instance the work is performed only by volunteers.

Dispensary.—General: Each of the three hospitals not included in the first report maintains an associated dispensary in the same plant with the hospital. One dispensary occupies four floors; in the others, two each. The dispensary occupies the entire building in each instance. The number of waiting rooms is respectively 6, 2, and 4. The number of examining rooms, sixty, twenty-six, and ten. One has no isolation rooms.

The average daily clinic attendance in the same order is 425, 150, and 221 persons, and the total attendance for the last fiscal year, 20,000, 9,205, and 67,569 persons. Discrepancies appear in the figures reported to us in two instances, for obviously a daily attendance of 425 when the clinic is open six days weekly, as it is in each instance, would equal a total of considerably more than 20,000 for the year,

and the same thing is true when attendance figures are reported at 150 daily and 9,205 for the year. New patients in each clinic reported for the last fiscal year are respectively 12,000, 4,311, and 4,988 individuals.

Few cases in any instance come from more than thirty miles away. None are seen only by appointment. All charge a fee of 25 cents for the first visit and 10 or 25 cents for subsequent visits. In each dispensary patients who are able to pay physicians are rejected. Eligibility is determined by social service departments.

Organization: Two dispensaries have medical directors and in each instance, he is directly connected with the associated hospital.

Each dispensary has available specialists in practically all specialties listed in the questionnaire. Pediatricians are in regular attendance in each instance, and general medical clinics are held daily. Specialty clinics are not held daily in any dispensary. Usually they are held once or twice weekly, except in one instance in which the eye clinic is held daily.

Special: The professional staff serves in both hospital and dispensary in two instances; one did not reply. Each dispensary obtains and files case records on all cases, and these clinical records accompany the patient if he is admitted to the hospital.

All refer patients discharged from the hospital back to the clinic for follow-up, and the hospital records are available there if they are needed. In only one instance are all cases first seen by the medical department.

In each instance cases suspected of contagion are immediately put into isolation.

Medical students receive instruction in each dispensary. In each instance the dispensary is organized into special clinics, such as cardiac, nephritic, diabetic, tuberculosis, etc., as listed in the original report, and all can offer service in practically all of the usual specialties. Two dispensaries maintain separate clinic sessions for infants.

Laboratory Facilities; Clinical: Two dispensaries use the hospital laboratory. One has its own laboratory but does not consider its facilities adequate.

Blood, urine, and stool examinations and blood chemical analyses may be made in each dispensary. None of the three dispensaries has a special laboratory for serologic or bacteriologic work.

Photographs are taken in the dispensary in one instance. One dispensary has a separate x-ray department but may also use the hospital department. As previously noted these departments are considered adequate for their needs. Two have facilities for physiotherapy in the dispensary.

Nursing: There is a head nurse in charge of each dispensary; two hospitals have supervising nurses as well. Two employ no other graduate nurses. One employs seven graduate nurses in addition to the head nurse and supervisors. Two train students and postgraduate nurses in the dispensary. In no instance is home visiting carried on by the nurses.

Student Nursing—Training: One dispensary has no student nurses on duty. The other two employ eight, ten, and three, respectively. The length of the service in the same order is two and one months. All student nurses get experience in all departments of the dispensary in these instances. In no instance do student nurses do home visiting.

Social Service: Each dispensary has a social service department, the number of workers being respectively three, two, and six. In only one instance are these workers used only for dispensary cases. In only one instance are all new patients first seen by the social service department. However, each reports that social

histories are taken in all patients seen, and these histories are available to the attending physicians. Social histories have a permanent separate file in each clinic. Social service makes home visits in two instances.

All dispensaries use volunteers. They are in regular attendance, and their work in each instance is considered satisfactory.

Dietitian Service: Two dispensaries have dietitians assigned them, but only one for the dispensary alone. These dietitians see new patients only when they are referred by the clinicians, and, if it is necessary, they are seen at proper regular intervals thereafter.

One dispensary supplies practical teaching in the preparation of diets to the dispensary patients.

GENERAL SUMMARY

Thirty-eight children's hospitals in the United States and Canada have been reviewed in previous reports. One of these hospitals was closed some time before the publication of the first report.

All of these hospitals are located in large cities with two exceptions, the Children's Hospital of Iowa City and the Children's University Hospital of Ann Arbor, Mich. These two hospitals are teaching institutions in connection with medical schools. Three of the hospitals are in Canada, thirty-eight (now thirty-seven) are in the United States. The distribution of the hospitals is not even, the northeastern part of the country having the largest number of these institutions. We find only nine west of the Mississippi River, and four of these are on the Pacific coast. The others are to be found one each in Kansas City, Iowa City, Denver, and Saint Louis. We might add the one in Winnipeg, Canada, to this group. The total number of beds in all hospitals is divided as follows: 500 to 600 bassinets; 1,500 to 1,600 cribs; and 3,700 to 4,000 beds. Private rooms constitute only about 8 per cent. Wards predominate and about 60 per cent of the wards are divided into cubicles.

The institutions are usually located in fairly good neighborhoods. The cost per patient per day varies from $1.87 to $9.21.

As near as can be estimated from the White House Conference statistics, children's hospitals contain approximately one-fifteenth of the beds for children in the country. We may be sure that all beds reported as for children in children's hospitals are used for children. Quite the contrary is true in general hospitals, and the statistics derived from those sources are unreliable, so that it is altogether likely that the beds in children's hospitals constitute more nearly one-tenth than one-fifteenth of the hospital beds for children in the United States. We note with interest that only a very small proportion of the beds, not to exceed 8 per cent, are in private rooms. It should be borne in mind that private rooms are by no means always used for the care of private patients, for in most children's hospitals these private rooms are often used for the care of seriously ill children; frequently these are charity cases. This fact brings out another very definite characteristic of the children's hospitals of this country, that they are essentially charity hospitals. We are pleased to report that in most of these children's hospitals medical teaching is done. Many of them are under the direct control of medical schools, and many more are used for teaching purposes by medical schools. All physicians know that where such teaching facilities are provided in hospitals, the care of the patient is usually far above the general level of the care of patients in other hospitals of the same community. These facts in themselves speak very strongly for the excellence of the children's hospitals.

The hospitals derive their income from various sources. Many of them are city, state, or county institutions. Others are supported by local communities, and others,

largely by funds from endowment. No children's hospital so far as we are able to determine is at all near self-supporting. As a rule, the income derived from patients is an exceedingly small proportion of the total income. We doubt if any children's hospital in the United States or Canada derives 5 per cent of its income from patients.

As far as the personnel of the hospitals is concerned, we should first consider the superintendents. The position of the superintendent in a modern hospital is one which requires excellent technical knowledge and much special training. Many of the superintendents of hospitals have grown up in hospital work, and the primary object of their early training has not necessarily been to fit them for that position. The time is fast approaching, however, when we must expect the superintendents of hospitals to be specially trained individuals and we will not choose them because they happen to have been previously associated with the hospital in some other capacity in which they showed good ability. One finds that among the group acting as superintendents of the children's hospitals a rather large number have been registered nurses. There is, of course, no reason why a registered nurse or a physician might not make a good hospital superintendent, but the fact that an individual is a physician or a registered nurse is no special recommendation for such a highly specialized position. We have no means of knowing whether the superintendents of these children's hospitals have had special training or not.

The attending staffs are adequate in practically every institution and are probably as good as can be obtained in the community since most of the hospitals are in connection with medical teaching centers.

As to the house staffs, there is a rather general recognition of the need for residents and the functions usually assigned to them. Many employ assistant residents as well, and all provide for interneships. It should be said, however, that some of the children's hospitals have internes who take part-time rotating services in general hospitals. Where this is true, the length of the service in the children's hospital is usually so short that the service to the hospital is practically of no value and the amount of knowledge gained by the interne is so small as to be only misleading. Interneships for less than six months should be abolished.

As previously mentioned, the children's hospitals probably have been among the first to recognize and meet the responsibilities of all hospitals in their communities. They not only take care of a large number of charity cases, but they provide means for teaching physicians and medical students; many have courses for nursery maids and laymen to an extent that is not duplicated to our knowledge in other hospital groups. In other words, the teaching facilities in children's hospitals as viewed by our present standards are excellent. One of the essential functions of the children's hospitals is to disseminate knowledge regarding the child to all groups of the population. In general this work is well done.

The exact equipment and facilities of a hospital are difficult to determine from a questionnaire, but, according to the questionnaires which we have reviewed, it seems to us that these facilities are modern and adequate in most instances and that every means is taken to protect the children in these hospitals. The replies indicate that almost any type of case, if it is not too infectious in nature, may be brought into a children's hospital and there receive efficient care. Many of the children's hospitals either have their own contagious wards or have access to, and cooperate with, contagious hospitals.

In considering the nursing facilities offered by the children's hospitals in this country, we cannot formulate opinions from information concerning these hospitals alone. We must remember the somewhat frequent inadequacy of pediatric training for nurses in the general hospitals of this country and must also realize that many of these general hospitals send nurses to our children's hospitals for their pediatric

training. A comparatively small number of hospitals have the three-year courses in pediatric training. Probably more of these courses are needed to provide special pediatric training for head nurses in wards in general hospitals or in the children's hospitals. We can only say that the number of nurses trained in the children's hospitals is probably too small to meet the demand for them and that this is not so much the fault of the children's hospitals as of the general hospitals which have not developed adequate facilities for the care of children and therefore make arrangements with children's hospitals whereby their nurses may receive only short and often inadequate training in case they expect to continue in children's nursing. The training that nurses receive in the children's hospitals, of course, varies greatly, but on the whole it seems to be adequate in proportion to the amount of time spent. The hospital training, in the hands of graduate nurses in all institutions, seems to be open to a few criticisms. One great criticism, however, is that most of the children's hospitals have not given sufficient attention to instruction in normal child psychology and behavior, and comparatively few afford these nurses any experience in kindergarten or nursery school work.

As a whole, the physical equipment of the hospitals is good. Four-fifths of them at least have physiotherapy departments. The diet kitchens seem to be adequate. Occupational therapy and schooling are available in about half of the hospitals. In a few instances there is considerable room for improvement in these departments, as they can be important units in any hospital. It is rather surprising that more do not have them. Recreational facilities for convalescents are varied, but again this is a weak department in many instances. X-ray facilities on the whole are good. The laboratory and pathologic departments apparently are fairly adequate. In many instances there is considerable room for improvement. It would seem to be relatively simple for many of these hospitals now lacking them to provide occupational therapy and schooling, and it is to be hoped that they will do so.

The need for social service is generally recognized, but there is some question as to the adequacy of the training of some of the persons who direct such departments. In most instances the work of the social service departments is very thoroughly done, and volunteers are freely employed. The convalescent care for children, however, appears to be inadequate or at least can be considerably improved upon in nearly all of the hospitals.

Of the thirty-eight hospitals, thirty-six maintain dispensaries in direct connection with the hospital, and one of the hospitals, as stated previously, has closed. The dispensaries on the whole reflect the general excellence of the hospitals. The number treated in the dispensaries varies from less than 1,000 to 80,000 a year; the fees charged, from 10 cents to $1.00. The dispensaries are almost without exception run in close connection with the hospitals, and each has an interlocking staff in medicine, nursing, and social service. While there is some variation in the type of work done, we may say that in general the facilities are excellent to insure efficient work. The dispensaries, as well as the hospitals, are used for teaching purposes, and in them physicians, medical students, nurses, and laymen receive instruction.

Academy News

Dr. Maurice L. Blatt, of Chicago, has accepted the state chairmanship for Illinois.

Dr. Albert S. Root, of Raleigh, has accepted the state chairmanship for North Carolina.

Dr. Edwin G. Schwarz, of Fort Worth, has accepted the state chairmanship for Texas.

Dr. D. Lesesne Smith, of Spartansburg, has accepted the state chairmanship for South Carolina.

Dr. Joseph I. Linde, of New Haven, has accepted the state chairmanship for Connecticut.

Addendum

Hemophilus Pertussis Endoantigen (Krueger)

G. F. Munns, M.D., and C. A. Aldrich, M.D.

Since the publication of the article concerning Krueger's pertussis endoantigen,* the strength of the antigen has been increased to 10 mg. of nitrogen per 100 c.c., representing approximately ten billion bacilli per cubic centimeter. The dosage as recommended for this preparation is as follows: Treatment, daily subcutaneous injections of from 0.5 to 2 c.c., the dose varying according to the therapeutic response of the patient. It is recommended that active treatment should be continued from ten to fifteen injections. For prevention in exposed cases or those liable to exposure, an initial dose of 1 c.c. is recommended followed every other day by 2 c.c. subcutaneously until six doses have been given.

*J. PEDIAT. 5: 590, 1934.

Book Review

Traité de Médecine des Enfants. Published under the direction of P. NOBÉCOURT and L. BABONNEIX; Editorial secretaries, J. Cathala and J. Hutinel, Masson et Cie. Libraires de l'Academie de Médecine; 120 Boulevard Saint-Germain, Paris, 1934, 5 volumes.

This five-volume work of 4,762 printed pages is the first French system of pediatrics to be published since 1909, when V. Hutinel, father of one of the editorial secretaries of the present work, published his *Les Maladies des Enfants* and Cruchet, his *La Pratique des Maladies des Enfants.* The last edition of Grancher and Comby's *Traité des Maladies des Enfants* is five years older. The appearance of the present Traité, therefore, is an important event in French pediatrics, and for pediatricians outside of France it affords an interesting opportunity to observe the development of the pediatric field in that country.

The two editorial directors, MM. Nobécourt and Babonneix, are well known by reputation to many Americans and represent the "school" of the late Victor Hutinel, as do the two editorial secretaries. Seventy-four collaborators have assisted in the preparation of various sections and the directors emphasize the fact that the list also includes followers of the other chief "school" of French pediatrics, that of Marfan. It is of some interest to note, as reflecting the centralization of medicine in France, that fifty-eight of these collaborators come from Paris, nine from Lyons and not more than one from any other one place. Two are from Switzerland. Some of the names such as Apert, Debré, Lereboullet, Lesné, Lhermitte, Policard, Robin, Paul Rohmer, Tixier, and others are well known to American pediatricians.

The first volume contains an interesting historical introduction, dealing almost exclusively with French pediatrics; and there are sections on normal growth and disturbances of growth; on diseases of nutrition (including diabetes mellitus and insipidus, "arthritisme," chronic articular rheumatism, and gout); diseases of the newborn; on congenital malformations; on deficiency diseases; on diseases of the endocrine glands; on "lymphatisme and lymphoscrophulose"; on disorders caused by physical agents; on disturbances of heat regulation, and, finally, on rapidly fatal hyperthermia after operation in young infants (the term "nouveau-né" apparently applies to the first six months of life). Of these sections, that dealing with normal growth and development contains much valuable material, though it leaves out nearly all the anthropometric work of American students of the subject; that on the deficiency diseases is excellent; diabetes mellitus is well and fully presented (apart from the omission of the names of the discoverers of insulin!); that on the endocrine disorders contains much interesting material. The section on "arthritisme" (a diathesis alleged to include such diverse conditions as gout, obesity, diabetes, eczema, gallstones, kidney stones, asthma and chronic rheumatism) has no place in a modern treatise on pediatrics and reflects the familiar tenacity of tradition in French clinical medicine. To a lesser degree, the same remarks may be made of the section on "lymphatisme et lymphoscrophulose," although here the conception of diathesis is hedged about with many reservations; the authors, indeed, concede that in most cases, so-called lymphatism is synonymous with scrofula (tuberculosis).

The second volume covers most of the specific infectious diseases, including typhoid, syphilis, tuberculosis, kala-azar, typhus, dengue, Malta fever, relapsing fever, yellow fever, and others; diseases of the spleen and blood, including malignant lymphogranulomatosis (Hodgkin's disease). A final chapter is devoted to chronic cervical adenitis, scrofula—illustrating again the persistence of the traditional conception of lymphatic enlargement in general as a pathologic entity in spite of the admitted etiologic diversity (tuberculosis, syphilis, lymphogranulomatosis, diseases of the blood, and malignant tumors are listed). This volume will be of particular reference value for its careful and detailed descriptions, from the pediatric aspect, of the "exotic" infectious diseases, such as dengue, typhus, Malta fever, yellow fever, etc., which are described in nearly all medical texts as they occur in adult life.

In Volume III, 131 pages are devoted to disorders of the heart and blood vessels. Descriptions of the congenital anomalies of the heart and vessels are in many instances disappointingly brief and inadequate. Coarctation of the aorta, for instance, is barely mentioned and, under arterial hypertension, is not suggested as a cause of high blood pressure in childhood. Almost nothing is said of electrocardiography. On the other hand, there are a number of instructive diagrams of the cardiac silhouette in various forms of cardiopathy, a good description of periarteritis nodosa (Kussmaul's disease), and some interesting notes on diseases and anomalies of the capillaries.

The larger part of this volume is given up to diseases of the respiratory tract. We note several good drawings of malformations and diseases of the larynx, and numerous excellent reproductions of radiograms, histopathologic preparations and temperature charts. The section on dilatations of the bronchi (including congenital cystic lung) is excellent, although, surprisingly, the names of Sicard and Forestier, who introduced iodized oil as a diagnostic method, are omitted. There is no section on foreign bodies. It is interesting to find the rôle of protein sensitization as an etiologic factor in asthma minimized. There are detailed descriptions of hydatid cysts of the lung, of actinomycosis, of tumors of the lung. Nearly 60 pages are devoted to pulmonary tuberculosis in childhood. The term "spleno-pneumonia" (a separate section on this is to be found also under "pneumonia") is preferred by the French for what is elsewhere known as "perifocal reaction" and "epituberculous infiltration." The last 400 pages of this volume cover most of the digestive disorders of childhood. Paul Rohmer's chapters on intestinal obstructions, megacolon, and celiac diseases are excellent.

Volume IV includes descriptions of peritonitis, of diseases of the liver (including jaundice), of the kidney and urinary passages, of various forms of poisoning, of diseases of the bones and joints (including syphilis), on the skin, of the eye, and finally a portion on psychiatry. The section on the skin is particularly full and well illustrated.

The last volume is devoted mainly to diseases of the central nervous system and contains a large amount of most useful and instructive clinical material, upholding the high traditions of French neurology. This portion of the work will be most useful for purposes of reference to the general reader and to the specialist in neurology. It is, however, disappointing to find under poliomyelitis such incorrect statements about the experimental disease as that the rabbit is a susceptible animal, that the intraperitoneal route is apparently the best, that the virus is propagated via the lymphatic channels, and that the majority of the tissues and viscera are virulent—all these statements having been repeatedly disproved. There are good descriptions of acrodynia (called Selter's disease), Raynaud's disease, scleroderma,

etc. Tetany and spasmophilia are included in this volume. The final 250 pages are given up to therapy and medication, and afford an interesting insight into the methods in popular use by French clinicians.

The index to the entire five volumes is at the end of Volume V and contains 43 pages. It is not entirely adequate. Proof reading has in many places been careless and the French typesetters have had their usual difficulties with English and American names, especially those beginning with "Mac" and "Mc." E. V. McCollum will find his surname variously spelled "Mac Collum" and "Mac Callum"; "Mellanby" is regularly spelled "Mellamby," etc. No consistent policy of bibliographic reference for the work as a whole has been followed. Some of the articles are fully documented. In others the names of authors are given only in parentheses in the text, without citing title, journal, or page; and in others no bibliography at all is offered.

The set is bound in boards with leatheroid backs. The paper is thin but opaque, smooth, of good quality and permits excellent reproduction of the halftone and other illustrations. The type face is sharp and clear. The volumes are of convenient size (about seven by ten inches) for handling and, in general, the format is excellent.

This work, containing as it does a large amount of highly valuable material, should find a place in all well-equipped medical libraries.

H. K. F.

Comments

AT THE meeting of the executive committee of the Academy in December, Dr. Irvine McQuarrie, of Minneapolis, and Dr. Grover F. Powers, of New Haven, were added to the editorial board of the JOURNAL OF PEDIATRICS. The editorial board now consists of nine members including the editors. The editorial board is an active group which controls the general policies of the JOURNAL and is not merely a list of names for "window dressing." Manuscripts submitted to the JOURNAL must be approved for publication by at least two members of the editorial board.

THE appointment of Dr. Martha Eliot as assistant chief of the Children's Bureau, which was announced in December, should give satisfaction to every one. Dr. Eliot will have complete charge of the health activities of the Bureau. It would be difficult to find any one else more suited to or more capable of filling this position. Dr. Eliot is unique in that she has not only the social interest in children which is necessary, but she has also earned general recognition in pediatrics and in the scientific side of medicine. A graduate of Radcliffe College and Johns Hopkins Medical School, her pediatric training was received in St. Louis, Boston, and New Haven. In 1927 she became assistant clinical professor of pediatrics at Yale University School of Medicine and in 1932 was promoted to associate clinical professor. For the last ten years she has been director of the Division of Child and Maternal Health of the United States Children's Bureau. We are proud that among her numerous memberships in medical societies she lists the Academy of Pediatrics and is chairman of the Committee on Child Health Relations. Her outstanding scientific contributions have been chiefly on the subject of rickets, and her numerous carefully planned and controlled studies are familiar to all of us.

We are confident that the appointment of such an outstanding and respected pediatrician as Dr. Eliot will do much toward bringing the work of the Children's Bureau into a closer rapport with the medical profession as a whole than has existed in the past. We can be certain that the health activities of the Children's Bureau will be carefully planned from the medical standpoint, and she can be assured of our whole-hearted cooperation.

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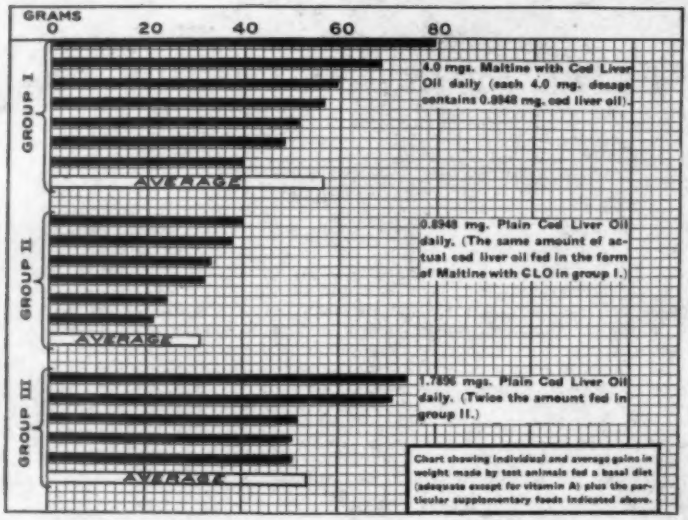
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0
20
40
60
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GROUP I
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GROUP II
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GROUP III
AVERAGE
1.7896 mgs. Plain Cod Liver Oil daily. (Twice the amount fed in group II.)
Chart showing individual and average gains in weight made by test animals fed a basal diet (adequate except for vitamin A) plus the particular supplementary foods indicated above.

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The accompanying chart is a graphic representation of results of the study referred to. While the feeding of 4.0 mgs. of Maltine With Cod Liver Oil (which contains 0.8948 mg. of cod liver oil) enabled the test animals to attain a certain growth rate, 0.8948 mg. of plain cod liver oil produced a decidedly lower gain in body weight. It was not until 1.7896 mgs. of plain cod liver oil (or twice the amount present in the 4.0 mgs. of Maltine With Cod Liver Oil dosage) was fed that the growth rate of the animals of this group approximated that of the group fed the Maltine With Cod Liver Oil. In other words, the vitamin A value of the cod liver oil was *doubled or enhanced twofold* when the oil was fed as Maltine With Cod Liver Oil.

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